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Sea Swallow

Annual Report of the Royal Naval Birdwatching Society

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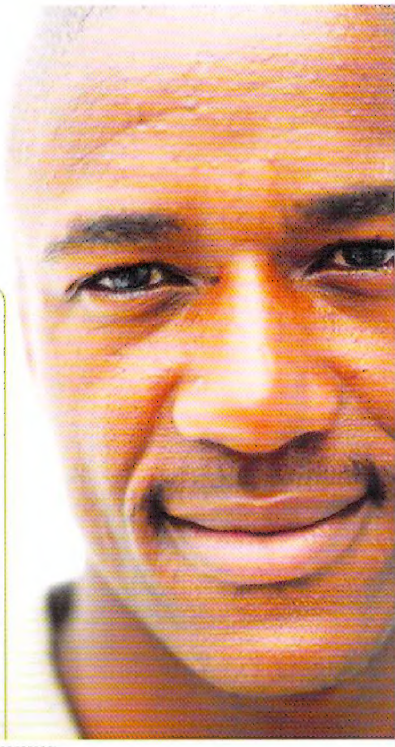

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Black-browed Albatross(nominate) *Diomedea melanophris*. 38.4S 140.6E off Port MacDonnell, South Australia. 31 May 2009.
Photo: Neil Cheshire.

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For details of Local Representatives and other useful addresses, see back page.

Aims and Activities: The primary aim of the Society is to promote a forum for the exchange of information on seabirds, and of landbirds at sea, by members for whom birdwatching is a spare-time recreation and hobby. The secondary aim is to co-ordinate the efforts of individual members using standardised recording methods so that observations can be of value to the professional ornithologist ashore. In addition to the promotion of observations afloat, the RNBWS organises fieldwork and expeditions, usually in cooperation with the Army and RAF Ornithological Societies.

Membership: has been widened from the RN to include those, regardless of nationality, who share a common background of the sea. Instruction for joining can be found on the Society Website and at the back of *Sea Swallow*.

Subscription Rates: Full and associate members £12 annually. Due 1 January.

Library rates: Cost of *Sea Swallow*, (£12) plus postage.

RNBWS Record Forms - can be found on the Society Website at www.rnbws.org.uk. Completed forms should be sent to the Gen Sec or Editor of SS for onward transmission.

Material for publication in *Sea Swallow* should be sent to the Editor. Instructions to authors can be found towards the back of this issue.

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CHAIRMAN'S FOREWORD

The past year has been a good one for the Society in that work has gone on to further most of our objectives. As Chairman, I am naturally keen that the Society should be better recognised and understood and so I have been delighted at the good coverage given by the MOD's Sanctuary magazine to both Pete Carr's Diego Garcia work and that of Steve Copsey and Mark Cutts in the Falkland Islands. I am also pleased to report that Pete is currently stationed in DG and so is well placed to continue the good work.

With a new appointment in Scotland, I have swapped the Cirl Buntings of Dartmouth for the Eiders of Helensburgh and with less and less time for birding, I was delighted to be able to join the RNBWS trip to Gibraltar in April. As well as witnessing the raptor migration over the Rock, a number of us made a couple of visits to Southern Spain and were well rewarded. For me, it was also particularly good to meet some of the longest serving members of the Society and I am pleased that we have been able to establish stronger links with the local conservation organisation, including giving some financial assistance towards the new water tank at the observatory. As a result, I hope we will be able to support 2 regular visits - in spring and autumn and I encourage all members to try to make time to go along for this remarkable and accessible spectacle.

My other recent treat has been to visit the Operation Auk ringing team at Cape Wrath where good management over many years has enabled many demonstrable conservation successes whilst keeping this important live firing range open for business! If any members would be interested to take part next summer then please let me know.

Other news this year includes substantial work by Frank Ward on the online records database and as a result of his effort, this valuable resource should be available at about the same time as Sea Swallow goes to press. More sadly, of course, I must report on the death of Ken Partridge, our Plymouth Representative who did much good work for conservation in that area. His obituary appears in this issue.

And finally, before you dive into this excellent issue - Caio Carlos's piece deserves a particular recommendation - please give a thought to how we might broaden our appeal and attract more members. I feel strongly that we can offer something to many - from casual birders who would like to increase their knowledge right through to those who thrive on the serious science of conservation - and we must ensure our appeal is broad if we are to thrive and support the work we wish to do. I hope to see you during the year.

Martin Alabaster

EDITORIAL

This latest edition of *Sea Swallow* sees a significant input from our Brazilian colleagues, particularly Ciao Carlos. His groundbreaking research on the status and activity of seabirds around the Brazilian coast is fascinating and I am delighted he has chosen to publish this work with us. I hope this new relationship will continue to be as prolific and worthwhile as this year's output.

I remain Editor of Sea Swallow for a further year as Pete Carr is still serving In Diego Garcia and is not due home until October 2010. I will produce Sea Swallow 59 and then hand over the reins.

I was saddened to hear of the death of Ken Partridge; he was a real stalwart of the Society and a very active local representative for the South West.

Please keep your records and articles coming in as without them we cannot produce a viable edition. Good birding for the coming year.

Elegant Tern *Sterna elegans*, Arica, Chile. 24 November 2004. *Photo:* Neil Cheshire.

NOTES ON SEABIRD REPORTS RECEIVED 2008-2009

by Neil Cheshire

Contributions are again at a modest level this year. Thomas Johannsen sent notes of interesting observations from two voyages crossing the North and South Pacific. David Ballance sent a large and detailed contribution from his voyages around the Antarctic Peninsula and the North and South Atlantic which makes up the bulk of this report. Stephen Chapman sent detailed notes from his now annual voyages in sail training ships. I have now retired from sea-going but include records from a pelagic trip in a fishing vessel from South Australia. All observers are thanked for their participation.

David K. Ballance	*m.v. Discovery*, Ushuaia-Antarctic Peninsula-Falklands-S. Georgia- Tristan da Cunha-Cape Town Feb 2009,18C *m.v. Black Watch*, Cape Town-Walvis Bay- Cape Verde Is-Teneriffe- Lisbon March/April 2009, 21C
Stephen Chapman	*s.t.s. Royalist* . Gosport-Channel Islands, May 2008, 1C *s.t.s. Lord Nelson*, Måløy-Bergen-Den Helder, Aug.2008 6C
Neil G. Cheshire	*f.v. Remarkable*, Off South Australia, May 2009, 2C
David Curtis/Dave Conway	Brittany Ferries, Portsmouth-Santander-Plymouth, April 2009 2C
David Curtis/Brian Craven	Portsmouth-Santander-Plymouth, May 2009 2C
Capt.Thomas Johannsen MN	*m.v. Pacific Fighter*, Vancouver-Honolulu-Auckland. Feb/March 2009. 4C Tauranga(NZ)-Longbeach (USA) April/May 2009.4C

Observers are referred to by their initials. Dates refer to 2009 unless otherwise listed. Positions are given in degrees and decimals of degrees of latitude and longitude.
nm = nautical miles (1.852 km), Ad = Adult, h = hours, imm = immature.

ALBATROSSES *Diomedeidae*

Wandering Albatross *Diomedea exulans* DKB counted 42 in 3h at 57.2S 66W and five at 58.7S 65.1W in Drake Passage on 11 Feb. His most southerly record was one at 59.1S 56.4W north of the South Shetlands on 14 Feb. Thereafter, he recorded them on most days from Falklands to South Georgia then to the east of Tristan da Cunha. Larger counts were nine at

54.7S 59.6W on 15 Feb, eight at 52.4S 50.9W on 18 Feb, 16 at 53.7S 40.2W and 24 at 54.2S 37.2W off S.Georgia on 19 Feb, and the last two at 36.3S 3.4W on 24 Feb. At 38.4S 140.6E on the shelf edge off South Australia 13 adults and 2 imm on 31 May (NGC).

Northern Royal Albatross ***Diomedea epomophora sanfordi***. One was seen at the shelf edge 38.4S 140.6E on 31 May (NGC).

Black-footed Albatross ***Diomedea nigripes***. During a North Pacific voyage from Vancouver to Honolulu, TJ recorded singles each day from 36N 125.1W to 20.9N 157.8W between 23 Feb and 3 Mar within the normal distribution area.

Black-browed Albatross ***Diomedea melanophris***. In Drake Passage DKB saw 12 singles in 3h at 57.2S 66W on 11 Feb. He also recorded small numbers around the Antarctic Peninsula and South Shetlands with the most southerly record at 62.8S 58.8W on 13 Feb. On 16 Feb his ship stood off Steeple Jason Island, W.Falklands where about 150,000 pairs of Black-brows were breeding. He had a maximum count off South Georgia of 28 in 2.7h at 53.8S 38.9W on 19 Feb thereafter small numbers each day to Tristan and on to Cape Town. Northbound his last sighting was one at 26.8S 14.8E in Namibian waters on 24 Mar. At 38.4S 140.6E off South Australia, 73 adults and 2 imm of the nominate sub-species and two adults of the distinct NZ sub-species *impavida* on 31 May (NGC).

Shy Albatross ***Diomedea cauta***. Approaching Cape Town DKB saw four singles at 34.1S 17.3E and five at 34S 17.9E on 27 Feb. Northbound from Cape Town he saw nine in 1.7h, some in heavy moult at 33.1S 17.6E on 24 Mar and the last off Namibia at 27.4S 15.1E the next day. At 38.4S 140.6E off South Australia, 37 adults, 1 juv and 2 imm on 31 May (NGC).

Shy Albatross (Immature) *Diomedea cauta*, 38.4S 140.6E off Port MacDonnell South Australia. 31 May 2009.*Photo:* Neil Cheshire.

Salvin's Albatross ***Diomedea salvini***. One adult at 38.4S 140.6E off South Australia on 31 May (NGC) (see photograph page 46).

Yellow-nosed Albatross ***Diomedea chlororyhnchos***. In the S.Atlantic DKB saw two at 42S 18.5W and eight at 40.1S 16W on 22 Feb and moderate numbers from there to the Tristan Group and small numbers from there to Cape Town where he arrived on 27 Feb. Further north in Namibian waters he sighted 15 in 3h at 19.3S 11.6E and the last at 17.6S 10.8E on 27 Mar.

Grey-headed Albatross ***Diomedea chrysostoma***. DKB recorded 8 singles in 3h at 57.2S 66W in Drake Passage on 11 Feb, one at 62.5S 62.1W at the South Shetlands on 12 Feb and singles at 42S 18.5W and 40.1S 16W on 22 Feb.

Buller's Albatross ***Diomedea bulleri***. At 38.4S 140.6E off South Australia, 11 adults on 31 May. Buller's Albatross are recorded in this area in small numbers between Jan and May (NGC).

Sooty Albatross ***Phoebetria fusca***. DKB reported one near the southern limit of its range at 52.8S 47.5S on 18 Feb, singles at 51.8S 32.5W and 51.1S 31.5W on 20 Feb, two adults and one imm at 45.6S 23.8W on 31 Feb and three at 37.1S 12.3W near Tristan on 23 Feb.

Light-mantled Sooty Albatross ***Phoebetria palpebrata***. One in Drake Passage at 57.2S 66W on 11 Feb, one east of Staten Island at 55.2S 59.2W on 15 Feb, one in Grytviken Harbour, S.Georgia on 19 Feb and two singles at 45.6S 23.8W on 21 Feb (DKB). NE from New Zealand TJ reported one at 32.6S 177.7E on 16 April.

FULMARS ***Fulmarinae***

Southern Giant Petrel ***Macronectes giganteus***. DKB provided reports of this species and Giant Petrel sp. from the Antarctic Peninsula and South Atlantic, 10-25 Feb. Notable sightings were 27 including two white phase birds at 62.9S 60.7W in South Shetlands, 54 at 51.1S 60.5W W.Falklands on 16 Feb. One all dark imm at 38.4S 140.6E off South Australia on 31 May (NGC).

Northern Giant Petrel ***Macronectes halli***. DKB reported singles at 55.3S 59.2W and 54.7S 59.6W south of the Falklands on 15 Feb, one at 52.4S 50.9W on 18 Feb and six at 53.7S 40.2W off S.Georgia on 19 Feb. Fifteen dark immatures came to a berley slick around a fishing vessel at 38.4S 140.6E off South Australia on 31 May (NGC).

Northern Fulmar ***Fulmarus glacialis***. In the Western Approaches DKB saw 22 in 2.7h at 48N 6.2W, six at 48.5N 5.8W and 133 in 2.7h of which about 60 were feeding near fishing vessels at 49.7N 3.9W on the 12 April. SC saw two off Alderney on 3 May'08. In Norwegian waters he recorded nine at 60.2N 3.2E on 13 Aug'08, 15 following at 59N 0.7E further offshore the same day and two at 56.9N 0.4W on 15 Aug'08. In the northern Bay of Biscay DC saw 7 at 46.9N 4.9W on 15 April, 5 at 47.9N 5.2W the next day. In southern Biscay he recorded two at 44.3N 4W and one at 43.6N 3.8W on 14 May. SW from Plymouth he saw 14 at 49.8N 4.5W on 16 April and further east 12 at 50N 2.9W on 13 May.

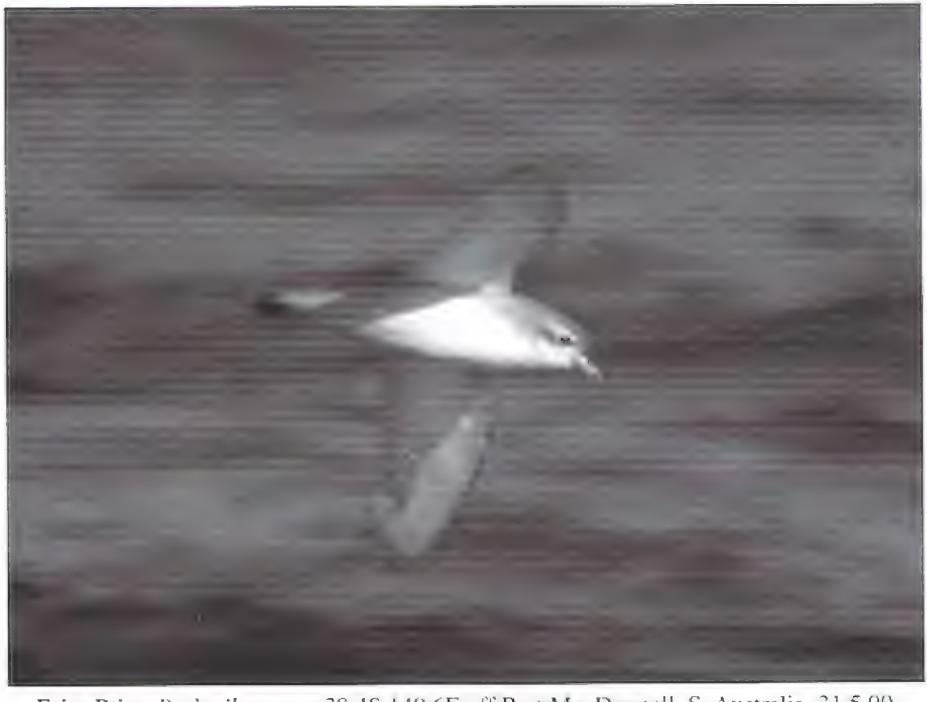
Southern Fulmar ***Fulmarus glacialoides***. DKB saw a group of three at 62.9S 60.7W in the South Shetland group on 12 Feb, counted 24 in 1.7h at 62.8S 58.8W the next day and 13 at 60.7S 55W on 14 Feb.

Cape Petrel ***Daption capense***. Around the South Shetlands DKB recorded 160+ in 1.7h at 62.5S 62.1W, 156 in 2h at 62.9S 60.7W and 30+ off Half Moon Island on 12 Feb. Further north he saw 19 at 61.3S 54.9W, 54 at 60.7S 55W and 27 at 59.1S 56.4W on 14 Feb then small numbers around the Falklands on 15 and 16 Feb and 11 at 54.3S 37.2W close to S.Georgia on 19 Feb. In South Australian waters at 38.4 S 140.35 E near the edge of the shelf, 24 were seen on 31 May (NGC).

Snow Petrel ***Pagodroma nivea***. DKB saw six, reported as Lesser Snow Petrel *P.n.nivea* at 63S 57.2W in Bransfield Strait on 13 Feb.

Broad-billed Prion ***Pachyptila vittata***. DKB had one on board at 42S 18.5W SW from Tristan da Cunha and counted 33 in 2.7h at 40.1S 16.1W on 22 Feb. The next day he reported 20 at 37.1S 11.7W.

Antarctic Prion ***Pachyptila desolata***. Large numbers of Prion sp. and this species near South Georgia on 19 Feb with 54 at 53.6S 40.2W, 3300+ at 53.8S 38.9W and 410 at 54.3S 37.2W. He also reported 52 at 45.6S 23.8W on 21 Feb.



Fairy Prion *Pachytila turtur.* 38.4S 140.6E off Port MacDonnell, S. Australia, 31.5.09. *Photo:* Neil Cheshire.

Blue Petrel *Halobaena caerulea*. One was seen by DKB in the W.Falklands at 51.1S 60.3W on 16 Feb.

Great-winged Petrel *Pterodroma macroptera*. Three singles were reported by DKB on 11 Feb at 58.7S 65.1E in Drake Passage where it is seldom seen, one in the Falklands area at 51.1S 60.5W on 16 Feb and from 44.9S 22.5W 21 Feb he recorded small numbers each day to Cape Town. Northbound off RSA/Namibia he saw seven singles at 28.7S 15.6E and one at 26.8S 14.8E on 25 March. Fifteen were seen at the shelf edge at 38.4S 140.6E off South Australia on 31 May (NGC).

Atlantic Petrel *Pterodroma incerta*. One at 38S 12.5W off Inaccessible Island on 23 Feb (DKB).

Black-winged Petrel *Pterodroma nigripennis*. TJ saw one at 28.5S 179.7E near the Kermadecs on 15 March.

Fea's Petrel *Pterodroma feae*. Near the Cape Verde Islands DKB recorded one at 13.7N 23W on 4 April and five singles the next day at 17.1N 24.9W.

Soft-plumaged Petrel *Pterodroma mollis*. At the SW extremity of the distribution in the South Atlantic DKB counted 13 in 2h at 59.1S 56.4W on 14 Feb and one the next day at 53.1S 60.6W south of the Falklands. He saw the species in good numbers between the Falklands and S.Georgia with 49 in 3.6h at 52.4S 50.8W and 39 in 3.8h at 53S 46W on 18 Feb, 15 at 53.6S 40.2W and two approaching S.Georgia at 53.8S 38.8W on 19 Feb. Thereafter from 20-23 Feb he saw small numbers each day between S.Georgia and Tristan da Cunha. Northbound from Cape Town he recorded a pair in Namibian waters at 19.3S 11.6E on 27 March.

Hawaiian Petrel *Pterodroma sandwichensis*. Until recently it was considered a sub-species of the Dark-rumped Petrel *P.phaeopygia*. TJ reported 20 near Hawaii at 20.9N 157.8W on 3 March and 10 at 13.1N 161.6W on 5 March and one at 22.8N 127.8W on 2 May.

SHEARWATERS *Procellariinae*

Grey Petrel *Procellaria cinerea.* One was seen by DKB south of the Falklands at 53.6S 60.3W on 15 Feb and a total of 12 between 52.4S 50.8W and 53S 46W Falklands to S.Georgia on 18 Feb.

White-chinned Petrel *Procellaria aequinoctialis*. DKB saw five singles in Drake Passage at 57.2S 66.1W on 11 Feb and many in the normal South Atlantic range. Off Namibia he counted 249 in 2.2h at 26.8S 14.8E on 25 March, 240 in 3h at 19.8S 11.6E and 13 in 1.2h at 17.5S 10.5E on 27 March. One bird with an extensive 'white chin' similar to western Indian Ocean and South Atlantic breeding birds was seen at 38.4S 140.6E off South Australia on 31 May (NGC).

Spectacled Petrel *Procellaria conspicillata*. This species recently split from White-chinned breeds only on Inaccessible Island in the Tristan group. DKB saw one at 45.5S 23.3W about

1000nm WSW from Tristan on 21 Feb, seven singles at 41.2S 17.4W the next day, a few around Tristan on 23 Feb, and small numbers from 24-25 Feb east to 35.5S 4.3E. He also had good views of one at 19.8S 11.7E off Namibia on 27 March.

Cory's Shearwater ***Calonectris diomedea***. DKB reported five seen SW from Tristan at 40S 16W on 22 Feb. He also counted 310 in 2h approaching Cape Town at 34.1S 17.3E on 27 Feb, 69 in 2.2h nearby at 33.2S 17.6E on the 24 March and 212 in 1.7h at 29.3S 15.9E the next day. In the North Atlantic he saw four at 9N 19.4W on 3 April, 26 at 26.3N 17.6W on 7 April, 35 in the Canary Islands at 28.8N 16W on 8 April, six at 32.3N 13.7W, 11 at 32.9N 13.3W and 17 at 34.8N 12W all on the 9 April. SC saw two when passing south of Alderney on 3 May'08.

Cape Verde Shearwater ***Calonectris edwardsii***. DKB reported 25 in 1.5h at 17.1N 24.9W off Mindelo, Cape Verde Islands, distinguished from Cory's by their darker greyish bill.

Wedge-tailed Shearwater ***Puffinus pacificus***. In the central Pacific TJ saw one at 13.1N 161.6W on 5 March, two the next day at 8.5N 163.7W, 10 on the Equator at 167.5W on 8 March, four at 14.9S 174W on 11 March and two at 19.5S 176W on the 13 March

Buller's Shearwater ***Puffinus bulleri***. TJ reported one from the tropical Pacific at 15.5N 134.5W on 30 April.

Great Shearwater ***Puffinus gravis***. In the Falklands area DKB recorded 85 in 2h at 51.1S 60.5W on 16 Feb and 108 in 2h at 51.7S 57.3W off Port Stanley the following day. He saw one off S. Georgia at 53.7S 40.2W on 19 Feb and many around the Tristan Group where they breed on 22 and 23 Feb.

Sooty Shearwater ***Puffinus griseus***. DKB saw 10 at 56.3S 66.6E in Drake Passage on 11 Feb, 36 south of the Falklands at 54.7S 59.6W on 15 Feb, and counted 343 at the entrance to Port Stanley on 17 Feb. Crossing the South Atlantic they were absent until approaching Cape Town on 27 Feb where he recorded 350 at 34S 18.3E and 97 nearby at 33.7S 18.2E on 24 March. TJ saw 50 at 37.5S 176.2E in the Bay of Plenty, NZ on 15 April, 50 on their northward migration at 28.1S 177.8E west of the Kermadecs on 17 April and 10 the next day at 24.7S 179.9W off Tonga. One over-wintering bird was seen at 38.4S 140.6E in South Australian waters on 31 May (NGC).

Manx Shearwater ***Puffinus puffinus***. DKB sighted two singles at 44.3N 9W off NW Spain on 11 April and one in the Western Approaches at 48N 6.2W the next day. DC saw seven at 48.2N 5.3W near Ushant on 16 April and singles at 49.5N 4.7W and 49.8N 4.5W later the same day. In the Channel DC saw four at 50.4N 2.1W and two at 50N 2.9W on 13 May and one off Ushant at 48.5N 5.3W on 15 May.

Fluttering Shearwater ***Puffinus gavia***. There were 30 seen at 38.2S 140.6E between the coast and the shelf edge off South Australia on 31 May (NGC).

DIVING PETRELS *Pelecanoidinae*

South Georgian Diving Petrel ***Pelecanoides georgicus***. Two were identified on the basis of pure white axilliaries by DKB at 53S 46W, west of S.Georgia on 18 Feb. He also saw more Diving Petrels, this species or *urinatrix*, in small numbers along N coast of S.Georgia the next day.

STORM-PETRELS *Hydrobatidae*

Wilson's Storm-petrel ***Oceanites oceanicus***. DKB had numerous records around the Antarctic Peninsula, Falklands and S.Georgia during February with the most southerly record of four at 62.9S 60.7W on the 12th. During March he saw them during their northward migration with eight at 33.1S 17.6E in South African waters on the 24th, seven at 26.8S 14.8E off Namibia the next day and throughout the day on the 27th from 19.8S 11.7E to 17.5S 10.4E with a maximum count of 31 in 3h at 19.3S 11.6E. Up to 40 were attracted to a fishing vessel by using a berley slick at 38.4S 140.6E off South Australia on 31 May (NGC).

Grey-backed Storm-petrel ***Garrodia nereis***. DKB recorded the species from around the Falklands with three singles at 51.1S 60.5W on 16 Feb, 29 in 2h at 51.7S 57.3W near Port Stanley on 17 Feb, two at 52.8S 47.5W and one at 53S 46W on 18 Feb. A total of 50 were attracted to berley on the shelf edge off South Australia at 38.4S 140.6E on 31 May.

White-bellied Storm-petrel ***Fregetta grallaria***. In the Tristan area DKB reported one at 38S 12.5W, four at 37.1S 12.3W and six at 37.1S 11.7W on 23 Feb, single birds at 35.8S 1.2E and 35.5S 4.3E on 25 Feb and a single close to South Africa at 33.1S 17.6E on 24 March.

Black-bellied Storm-petrel ***Fregetta tropica***. In the South Shetlands area DKB saw one at 62.9S 60.7W on 12 Feb, nine singles at 62.8S 58.8W in Bransfield Strait the next day, 19 in 3h at 60.7S 55W near Elephant Island on 14 Feb and three at 51.6S 61.2W in Falklands seas on 16 Feb. In the South Georgia area he counted 26 in 3h at 53.6S 40.2W, 21 in 4h at 54.3S 37.2W and 22 in 1.5h at 54.1S 36.3W on 19 Feb.

European Storm-petrel ***Hydrobates pelagicus***. C.Miskelly per DKB recorded two well offshore from South Africa near the southern limit of their range at 34.5S 13.3E on 26 Feb.

Madeiran Storm-petrel. ***Oceanodroma castro***. In the equatorial Atlantic DKB saw one at 1.1S 0.7E and also had one on board here on 30 March. He also reported two singles at 2N 5.1W on 1 April, two at 7.3N 17.4W and two at 7.9N 18.1W on 3 April.

Leach's Storm-petrel ***Oceanodroma leucorhoa***. DKB recorded 14 singles and groups heading South at 34.9S 9.6E , another 33 at 34.8S 10.4 E also heading south, one at 34.6S 12.3E and one at 34.6S 13E well west from South Africa on 26 Feb. This is an unusual observation in late Summer at the southern extremity of the species' Atlantic range. Heading north from Cape Town a month later DKB saw seven at 33.1S 17.6E on 24th, nine at 27.4S 15.1E on 25th, one at 11.3S 6.7E on the 28th and two at 1.1N 0.4W on the 30 March.

TROPICBIRDS *Phaethontidae*

Red-tailed Tropicbird ***Phaethon rubricauda.*** In the central Pacific TJ observed two at 4N 165.6W on 7 March, two at 5.3S 169.7W on the 9 March and one at 11.4S 160.8W on 22 April.

White-tailed Tropicbird ***Phaethon lepturus***. DKB recorded the species in the tropical Atlantic with one at 11.3S 6.7E on 28 March, singles at 0.4S 0.2E and 1.1N 0.4W on 30 March and one at 8.5N 19W on 3 April. TJ saw one in the central Pacific at 8.5S 157.1W on 23 April.

GANNETS and BOOBIES *Sulidae*

Northern Gannet ***Morus bassanus***. DKB recorded a sub-adult east of Madeira at 32.8N 13.3W on 9 April. There were the usual records from the northern Bay of Biscay and the western approaches. Larger counts included 253 at 49.7N 3.9W on 12 April (DKB), 200 off St.Peter Port Guernsey on 3 May'08 (SC) and 149 at 50N 2.9W on 13 May'08 (DC).

Cape Gannet ***Morus capensis***. DKB had records in Feb and March from the Cape Town area north to Namibia, the last being three adults and two imm at 19.8S 11.7E on 27 March.

Australasian Gannet ***Morus serrator***. There were 500 feeding on a fish shoal at 35.7S 138.1E in Backstairs Passage off South Australia on 17 June. Numbers of local breeding Australasian Gannets around southern Australia are increased by migrants from New Zealand with most NZ juveniles departing west within a few weeks of fledging. They stay in Australian waters from 2-4 years.

Masked Booby ***Sula dactylatra***. TJ saw one at 20.9N 157.8W near Hawaii on 3 March and further south in the tropical Pacific had two at 13.4S 165W on 21 April, one at 11.4S 160.8W on 22nd, one at 5.5S 153.3W on 24th and one at 2.3S 150W on 25 April.

Brown Booby ***Sula leucogaster***. In Tongan waters TJ saw one at 23.9S 178.1W on the 14 March and two at 21.5S 177.6W on 19 March.

CORMORANTS and SHAGS *Phalacrocoracidae*

Cape Cormorant ***Phalacrocorax capensis.*** Recorded by DKB who saw 320 at 34S 18.3E approaching Cape Town on 27 Feb, 390 nearby at 33.7S 18.2E on 24 March and large numbers in the Walvis Bay area on 26 March.

Imperial Shag ***Leucocarbo atriceps***. In the Falklands area DKB saw four at 51.6S 60.9W, seven at 51.6S 61.2W and nine at 51.1S 60.5W on 16 Feb.

South Georgian Shag ***Leucocarbo georgianus***. DKB observed one at 54.3S 37.2W near Grytviken on 19 Feb.

PHALAROPES *Phalaropodidae*

Grey (Red) Phalarope ***Phalaropus fulicarius.*** In the wintering area off southern Africa DKB saw five at 34.1S 17.3E on 27 Feb, 21 in 1.7h at 33.1S 17.6E on 24 March, six at 26.8S 14.8E on 25 March and 21 in 1.2h at 17.5S 10.4E on 27 March.

SKUAS and JAEGERS *Stercorariini*

Great Skua ***Catharacta skua***. A few records from the western approaches and the Channel were received from DKB and DC.

Southern Skua ***Catharacta antarctica.*** DKB provided several records from the South Atlantic and Southern Ocean including 16 in the Falklands area at 51.6S 60.9W on 16 Feb and five counted in 2h approaching South Africa at 34.1S 17.3E on 27 Feb.

Chilean Skua ***Catharacta chilensis***. DKB recorded 10 in the Beagle Channel after sailing from Ushuaia on 10 Feb.

McCormick's Skua ***Catharacta mccormicki*** . DKB saw a few around the Antarctic Peninsula and South Shetlands with six in 2.2h at 6.5S 62.1W on 12 Feb, two at 63S 57.2W on 13 Feb and one at 60.7S 55W on 14 Feb.

Pomarine Skua ***Stercorarius pomarinus***. DKB saw several in southern African waters including 15 at 19.3S 11.6E and 14 at 17.7S 10.8E on 27 March. Further north he had one at 1.1S 0.7E on 30 March and two the next day at 4.8N 1.7W. SC saw one at 51.1N 1.4E in the North Sea on 19 Aug'08.

Arctic Skua ***Stercorarius parasiticus***. DKB reported 17 at 29.3S 15.9E and eight at 28.7S 15.5E on 25 March and notable numbers in Namibian waters on the 27 March with 53 at 19.8S 11.7E and 54 at 19.3S 11.6E. SC recorded on at 56N 1E on 18 Aug'08.

Long-tailed Skua ***Stercorarius longicaudus***. One was seen by DKB at 28.7S 15.6E off South Africa on 25 March and two more at 19.8S 11.7E in Namibian waters on 27 March.

GULLS *Larinae*

Yellow-legged Gull ***Larus cachinnans.*** DKB observed five at 38.5N 9.4W approaching Lisbon on 10 April.

Great Black-backed Gull ***Larus marinus*** DC counted 38 in 1h in mid Bay of Biscay at 45.8N 4.5W on 14 April.

Dolphin Gull ***Larus soresbii***. DKB saw five in the Beagle Channel, Argentina on 10 Feb.

Yellow-legged Gull *Larus cachinnans*, Ad. winter. Barcelona. 17 October 2008.
Photo: Neil Cheshire.

Little Gull ***Larus minutus***. DC saw 14 at 47.9N 5.2W in the northern Bay of Biscay on 16 April.

Sabine's Gull ***Larus sabini***. In the wintering area off southern Africa DKB recorded significant numbers including 104 in 2.5h at 34.1S 17.9E approaching Cape Town on 27 Feb, 86 in 1.7h nearby at 33.7S 18.2E and 176 in 1.7h at 33.1S 17.6E on 24 March, six at 26.8S 14.8E and two at 19.3S11.6E off Namibia on 27 March.

TERNS ***Sterninae***

Black Tern ***Childonias niger***. DKB saw three approaching Walvis Bay at 23S 14.7E on 26 March then later off West Africa four at 4.8N 1.7W on 31 March and one well offshore at 7.9N 18.1W on 3 April.

South American Tern ***Sterna hirundinacea***. In the Beagle Channel, 50+ on 10 Feb (DKB).

Common Tern ***Sterna hirundo***. One at 34S 18.3E near Cape Town was seen by DKB on 27 Feb who then saw an imm at 23S 14.7E off Walvis Bay on 26 March, and 22 Common/ Arctics at 44.3N 8.9W off NW Spain on 11 April.

Arctic Tern ***Sterna paradisaea***. DKB reported 11 heading N at 20.4N 22.5W offshore from Mauretania on the 6 April.

Antarctic Tern ***Sterna vittata***. DKB reported four at 37.1S 12.3W off Tristan da Cunha on 23 Feb.

White-fronted Tern ***Sterna striata***. Three at shelf edge at 38.4S 140.6E off South Australia on 31 May (NGC)

Sooty Tern ***Sterna fuscata***. Recorded by DKB from the equatorial Atlantic with 22 in two groups at 1.1S 0.7E and five at 0.3S 0.2E on 30 March.

Damara Tern ***Sterna balaenarum***. One at 23S 14.7E near Walvis Bay on 26 March(DKB)

Great Crested Tern ***Sterna bergii***. In South African waters DKB saw 194 at 34S 18.3E approaching Cape Town on 27 Feb, 328 nearby at 33.7S 18.2E on 24 March and 12 at 23S 14.7E near Walvis Bay on 26 March.

Royal Tern ***Sterna maxima***. DKB saw one at 4.8N 1.7W approaching Takoradi on 31 March.

Sandwich Tern ***Sterna sandvicensis***. DKB saw 300+ in Cape Town Harbour on 27 Feb, two at 23S 14.7E on 26 March, one at 4.8N 1.7W off Takoradi on 31 March, one at 3.4N 11.1W well offshore from Liberia on 2 April, one at 38.5N 9.4W approaching Lisbon on 10 April and two at 43.5N 9.5W the next day.

Brown Noddy ***Anous minutus***. DKB saw one at 37.1S 12.3E at Tristan, the species' most southerly breeding station, on 23 Feb.

White Tern ***Gygis alba*** TJ saw one in the tropical Pacific at 10.2S 171.9W on 10 March.

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SEABIRD DIVERSITY IN BRAZIL: A REVIEW

By Caio J. Carlos

Abstract

This paper presents a review of the current knowledge on seabird diversity in Brazil. The term 'seabird' is applied to members of the Orders Sphenisciformes (penguins), Procellariiformes (albatrosses, petrels, shearwaters and allies), some Pelecaniformes (boobies, gannets, pelicans and frigatebirds) and some marine Charadriiformes (skuas, gulls, terns and skimmers). A total of 91 species of 14 families have been confirmed in the country. Of these, 25 breed in the country and the remaining 65 are divided into the following categories: 'Migrants from Southern South America, sub-Antarctic or Antarctic regions' (28 spp.), 'Migrants from Northern Hemisphere' (13 ssp.), and 'Vagrants' (26 ssp.). Some species have two status categories because in Brazil migrant birds overlap with resident ones. Fifty species breed on Brazilian oceanic islands, while six have been nesting and breeding on small coastal islands in south-east and south Brazil. Seven species breed on the continental coast or further inland. Migrant birds include coastal (gulls and terns) and pelagic (penguins, albatrosses, petrels and skuas) species. Coastal migrants are mainly from the Northern Hemisphere, while pelagic ones originate from the Southern Ocean. Brazil harbours a significant diversity of seabirds and has great responsibility in the conservation of many species. However, there are still few conservation programmes involving seabirds. Many islands where seabirds breed (e.g. Fernando de Noronha Archipelago) are not adequately managed and important coastal habitats have suffered from several hundred years of degradation from human impacts.

Introduction

Brazil is the largest country of South America, occupying almost 50% the subcontinent's land area. The country's coastline is c. 8,500 km-long and lies roughly between 4°N and 34°S (Willwock 1994, Ab'Saber 2001; Figure 1). It contains a variety of environments including mangrove forests, sandy beaches, and coral reefs. From a geomorphologic point of view, the Brazilian coast can be divided into several distinct sectors, but for simplicity, here it will be divided in an Equatorial Coast, running from the border with French Guiana to Cabo de São Roque (c. 5°S) in the State of Rio Grande do Norte; an Eastern Coast, from Cabo de São Roque to the State of Santa Catarina (c.2 8°S); and a Southern Coast, including the State of Rio Grande do Sul. The following lines include a brief description of the environmental characteristics of these sectors, based on information taken from Instituto Brasileiro de Geográfia e Estatística (1977), Willwock (1994) and Ab'Saber (2001).

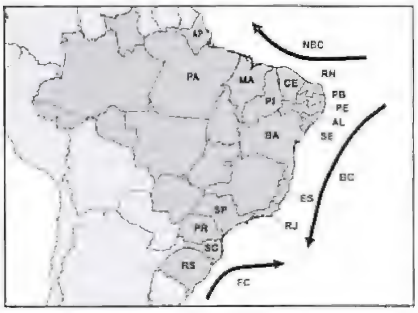


Figure 1. Map of Brazil showing coastal states and main oceanic currents. Abbreviations: AP-Amapá, PA-Pará, MA-Maranhão, PI-Piauí, CE-Ceará, - Rio Grande do Norte, PB-Paraíba, PE-Pernambuco, AL-Alagoas, SE-Sergipe, BA-Bahia, ES-Espírito Santo, RJ-Rio de Janeiro, SP-São Paulo, PR-Paraná, SC-Santa Catarina, and RS Rio Grande do Sul. NBC-North Brazilian Current, BC- Brazil Current, and FC-Falkland Current.

The northern part of the Equatorial Coast, between the States of Amapá and Maranhão, has extensive mangroves and contains the huge Amazon River estuary. In the States of Piauí, Ceará and northern Rio Grande do Norte the coast is sandy with isolated lagoons and mangroves restricted to major river mouths. The continental shelf is broad, up to 300 km in some places, but only 140 km in Ceará. The hydrography off Equatorial coast is determined by the Northern Brazilian current and the Amazon River discharge (Silveira *et al.* 1994).

The Eastern Coast includes 10 Brazilian states. The southern limit of this region (c. 28°S) roughly coincides with the southernmost extent of tropical ecosystems, such as mangroves. The coast is sandy, interrupted occasionally by rocky areas, bays, lagoons and estuaries. Many important estuarine complexes are found in the States of Paraíba (Barra de Mamanguape), Pernambuco (Canal de Santa Cruz), Bahia (Camamu and Todos os Santos bays), Rio de Janeiro (Sepetiba and Guanabara bays), São Paulo (Cananéia region), Paraná (Paranaguá bay) and Santa Catarina (Babitonga bay). There are many coastal islands between 20–30°S. Off-shore, the west-flowing South Equatorial current reaches the Brazilian coast just north of the city of Recife (c.8°S). The current splits, with the North Brazilian Current flowing north along the Equatorial Coast, and the Brazil Current flowing south-ward up to the Southern Coast (Silveira *et al.* 2000). Between 5–22°S the continental shelf is narrow, 50-90 km of width, but widens up 220 km between 24–28°S.

The Southern Coast includes (28°30'S, 34°00'S) the southern Santa Catarina and all Rio Grande do Sul. This coast is a long (> 700 km) sandy beach interrupted by the mouth of coastal lagoons, such the 'Lagoa do Peixe' and 'Lagoa dos Patos'. The continental shelf extends to 100-170 km from the coast. In the winter, the cold, northward flowing Falkland Current advances progressively over continental shelf (Castello & Moeller 1977, Garcia 1998). With such a range of different coastal and oceanic features, the Brazilian seas support a diverse fauna. Marine fauna of Brazil have been widely studied, especially after the Brazilian government established the 'Assessment of Living Resources in the Exclusive Economic Zone National Programme' in 1994 (Ministério do Meio Ambiente 2006). Knowledge of diversity of seabirds in Brazil gained up to the 1990s have been summarized in Pinto (1978), Sick (1997), and Vooren & Brusque (1999) and references cited therein. In the present paper my aim is to update this information, based mainly on my surveys in the literature, Brazilian museum collections and fieldwork in the last six years.

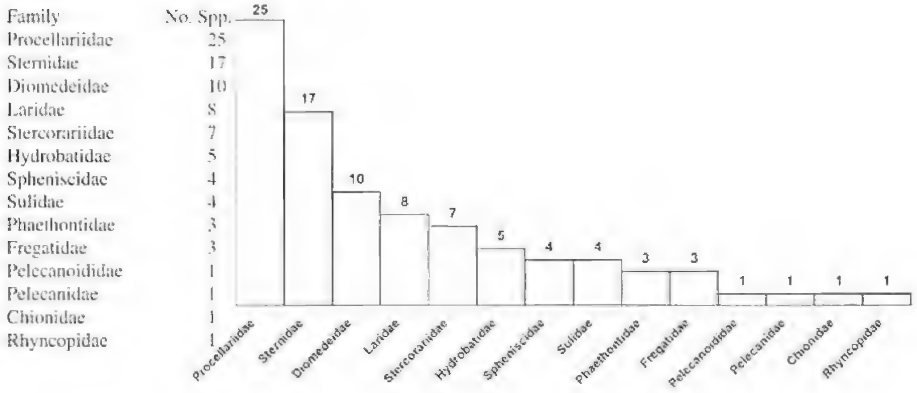
There is no single and unambiguous definition of what is a 'seabird'. For some authors, this term is applied to any species that obtain the majority of their food from coastal waters or from the open ocean, although some restrict its use to the latter group. Here the term 'seabird' is used taxonomically to members of the Orders Sphenisciformes (penguins), Procellariiformes (albatrosses, petrels, shearwaters and allies), some Pelecaniformes (boobies, gannets, pelicans and frigatebirds) and some marine Charadriiformes (skuas, gulls, terns and skimmers).

Diversity and status of seabirds in Brazil

According to data of the most recent check-list of Brazilian birds (Brazilian Committee of Ornithological Records 2008), a total of 91 seabird species of 14 families have been confirmed in the country (Appendix). The most diverse family is Procellariidae (fulmars, petrels, and shearwaters), with 25 (27%) species, followed by Sternidae (terns and noddies) with 17

(18%) and Diomedeidae (albatrosses) with 10 (11%). The number of species in each family is given in Figure 2.

Figure 2. Number of seabirds species confirmed in Brazil in each of the 14 families.



It should be mentioned here that species indicated as 'confirmed' are those with at least one record in Brazil supported by tangible evidence that is available for independent verification, namely, a whole or partial museum specimen, archived or published photographs, and video recordings (Brazilian Committee of Ornithological Records 2000, 2008). Species whose presence is supported only by sight records or by unpublished or non-archived tangible evidence are placed on a 'hypothetical list'. This category currently includes five birds known in the country from only a few doubtful sight records: Black-capped Petrel *Pterodroma hasitata*, Bulwer's Petrel *Bulweria bulwerii*, Little Shearwater *Puffinus assimilis*, Band-rumped (or Madeiran) Storm-petrel *Oceanodroma castro*, and Antarctic Cormorant (or Shag) *Phalacrocorax bransfieldensis* (Brazilian Committee of Ornithological Records 2008). Here the status of a given species refers firstly to whether it breeds in the country's territory or elsewhere. The winter ranges of some migrant species overlap with the ranges of conspecific residents. Thus five species (Laughing Gull *Leucophaeus atricilla*, Least Tern *Sternula antillarum*, South American Tern *Sterna hirundinacea*, Sandwich Tern *Thalasseus eurygnathus*, and Royal Tern *T. maximus*) are placed in two status categories. Of the 91 seabird species confirmed in Brazil, 25 breed in the country. The remaining 65 are divided into the following categories: 'Migrants from Southern South America, sub-Antarctic or Antarctic regions' (28 spp.), 'Migrants from Northern Hemisphere' (13 ssp.), and 'Vagrants' (26 ssp.) (Appendix). Migrant species are those which undertake seasonal movements in response to changes in food availability, habitat or weather. According to criteria adopted by Brazilian Committee of Ornithological Records (2008), vagrant species are those 'with apparently irregular occurrence in Brazil'. The category 'Vagrant' includes three penguins, five albatrosses, six petrels, two storm-petrels, one diving-petrel, one tropic-bird, one pelican, two gannets, one sheathbill, three gulls, and two terns (Appendix). For some of these birds (e.g. Brown Pelican *Pelecanus occidentalis* and Snowy Sheathbill *Chionis albus*) Brazil is probably an important part of their range.

Breeding seabirds in Brazil

As already mentioned, 25 seabird species breed in Brazil. Among this group, the family Sternidae is the most numerous with 12 species. There are also three petrels, three boobies, three frigatebirds, four gulls, and one skimmer confirmed to be breeding in the country (Appendix). Nesting and breeding occur mainly on oceanic islands, but there are some species with large colonies on coastal islands, and other on sandy beaches, lagoons and salt marshes along the mainland coast.

Brazil has six sets of oceanic islands: Saint Peter and Saint Paul Archipelago, Rocas Atoll, Fernando de Noronha Archipelago, Abrolhos Archipelago, and Trindade and Martin Vaz Islands. The islands' position and distance from the coast are shown in Table 1. Three petrels, two tropicbirds, three boobies, three frigatebirds, two noddies and two terns breed or formerly bred on these islands (Figure 3). The number of species on each island group varies from four on Saint Peter and Saint Paul to eleven on Fernando de Noronha (Alves *et al.* 2004, Both & Freitas 2004, Fonseca-Neto 2004, Schulz-Neto 2004a, b; Table 2). Six birds appear in the national list of threatened species in Brazil (Ministério do Meio Ambiente 2003): Trindade Petrel *Pterodroma arminjoniana* ('Vulnerable'), Audubon's Shearwater *Puffinus lherminieri* ('Critically Endangered'), Red-billed Tropicbird *Phaethon aethereus* ('Vulnerable'), Red-tailed Tropicbird *Phaethon lepturus*, Great Frigatebird *Fregata minor* ('Critically Endangered'), and Lesser Frigatebird *Fregata ariel* ('Critically Endangered'). Trindade Petrel is also globally threatened (BirdLife International 2004).

Figure 3. Masked Booby *Sula dactylatra* off Ceará, north-east Brazil; 4 September 2004. *Photo:* A. Campos (Aquasis).

Table 1. Position, distance from the coast and area of the six sets of Brazilian oceanic islands where seabirds are known to breed. Data were taken from Vooren & Brusque (1999).

Islands	Position	Distance from the coast
Saint Peter and Saint Paul archipelago	00°55'N, 29°21'W	960 km
Rocas Atoll	03°50'S, 33°40'W	240 km
Fernando de Noronha archipelago	03°50'S, 32°30' W	360 km
Abrolhos archipelago	17°55'S, 38°40'W	75 km
Trindade Island	20°30'S, 29°19'W	1.150 km
Martin Vaz Islands	20°15'S, 28°55'W	1.200 Km

Table 2. Seabird species breeding on Brazilian oceanic islands. The island groups are: Saint Peter and Saint Paul Archipelago (**SPSP**), Rocas Atoll (**RA**), Fernando de Noronha Archipelago (**FN**), Abrolhos Archipelago (**AA**), Trindade Island (**TD**), Martin Vaz Islands (**MV**). The symbols mean: breeding not observed so far (–); breeding confirmed (•); breeding was suggested, but not confirmed (?); and extinct (†).

[1] Refers to subspecies *Phaethon aethereus aethereus*;
[2] Refers to subspecies *Phaethon lepturus ascensionis*;
[3] Refers to subspecies *Fregata minor nicolli*;
[4] Refers to subspecies *Fregata ariel trinitatis*.

Species (English /Scientific names)	SPSP	RA	FN	AA	TI	MV
Trindade Petrel *Pterodroma arminjoniana*	–	–	–	–	•	•
Kermadec Petrel *Pterodroma neglecta*	–	–	–	–	•	?
Audubon's Shearwater *Puffinus lherminieri*	–	–	•	–	–	–
Red-billed Tropicbird *Phaethon aethereus*[1]	–	–	•	•	–	–
White-tailed Tropicbird *Phaethon lepturus*[2]	–	–	•	•	–	–
Masked Booby *Sula dactylatra*	•	•	•	•	?	?
Red-footed Booby *Sula sula*	–	–	•	–	†	–
Brown Booby *Sula leucogaster*	•	•	•	•	–	–
Magnificent Frigatebird *Fregata magnificens*	–	–	•	•	–	–
Great Frigatebird *Fregata minor*[3]	–	–	–	–	•	?
Lesser Frigatebird *Fregata ariel*[4]	–	–	–	–	•	?
Brown Noddy *Anous stolidus*	•	•	•	–	•	–
Black Noddy *Anous minutus*	•	•	•	–	•	–
White Tern *Gigys alba*	–	–	•	–	•	•
Sooty Tern *Onychoprion fuscatus*	–	•	•	•	•	•

Trindade Petrels breed on Trindade and Martin Vaz Islands (Sick 1997, Vooren & Brusque 1999), although there is no recent evidence of breeding at the latter site. Kermadec Petrels *P. neglecta* also nest on Trindade, where they are outnumbered by Trindade Petrels by a proportion of 20 to 1 (Imber 2004). Population of Trindade was estimated to be approximately

5,000 birds in the 1990's (Fonseca-Neto 2004), but this figure includes at least 5% Kermadec Petrels. Audubon Shearwater is 'Critically Endangered' in Brazil because its population is so small. Two nesting sites are known: Morro do Leão and Morro da Viuva islets in Fernando do Noronha archipelago, with 11 nests (Silva e Silva & Olmos in press); and the Itatiaia islands on south-eastern coast (Efe & Musso 2001; see below).

Greater and Lesser Frigatebirds are widespread in the Indo-Pacific Oceans, but Trindade harbours the only population of these species in the Atlantic (Brooke 2004). The Atlantic Greater Frigatebird (subspecies *nicolli*) was first noted in 1874, when a large number of nesting pairs was observed on Trindade (see Murphy 1936). Later expeditions to the island (e.g. Novaes 1952) successfully recorded its presence, but did not provide information on population numbers. Olson (1981) was unable to record the bird in 1975, but thought it could be nesting on Martin Vaz. A small colony was found in 1987–1992 and there are two recent (year 2000) records of birds collecting nesting material. The current status in Martin Vaz is not known. In 1994 about 100 birds were seen following a fishing boat operating near Trindade (Fonseca-Neto 2004). A small colony of Lesser Frigatebird (subspecies *trinitatis*) with five nests was recorded at Trindade in 1975, with a total population of about 50 birds (Olson 1981). Nesting was also observed in 1987–1992, but only five of flying birds were seen during several field-trips in 1994–2000 (Fonseca-Neto 2004).

The taxonomic status of Trindade Greater and Lesser Frigatebirds deserves a thorough investigation. Olson (1981) suggested that there are osteological differences between Atlantic and Indo-Pacific Lesser Frigatebirds. The Trindade Lesser Frigatebirds are believed to exhibit a distinctive juvenile plumage (Olson 1981). As occurred with Cape Verde Kite *Milvus fasciicauda* (see Sangster 2000), the frigatebirds of Trindade may be another case of a distinct species becoming extinct without anything being done because its taxonomic status was not resolved. The native vegetation of Trindade Island, once dominated by dense forests, has been almost eliminated through the combined destruction of man-made fires to open the land for failed colonization projects, and overgrazing by introduced pigs and goats (Olson 1981, Fonseca-Neto 2004). Forest destruction resulted in the collapse of tree-nesting seabirds, including Red-footed Booby *Sula sula* (currently extinct) and the two endemic frigatebird subspecies. In Brazil, Red-billed (subspecies *aethereus*) and Wither-tailed Tropicbirds (subspecies *ascensionis*) breed on Fernando de Noronha and Arbrolhos archipelagos (Sick 1997, Alves *et al.* 2004, Schulz-Neto 2004a). Despite being national parks, both Abrolhos and Fernando de Noronha have serious problems with introduced predators, especially rats. Apparently, there are no plans to control introduced predators, at least in Abrolhos, despite the issue being well-known to the Brazilian conservation agency.

A total of six seabird species have been nesting and breeding on small coastal islands in south-east and south Brazil, roughly between 21–29°S (Table 3). A least 37 breeding sites have been recorded on the coast of the States of Espírito Santo (4 sites), Rio de Janeiro (7 sites), São Paulo (15 sites), Paraná (3 sites) and Santa Catarina (8 sites). The State of Rio Grande do Sul in southernmost Brazil has no islands, and the alleged breeding colonies of Kelp Gulls *Larus dominicanus* along the state's coastline (Antas 1991) have never been confirmed. For each taxa, the number of breeding sites, in brackets, is as follows: Brown Booby *Sula leucogaster* (16), Magnificent Frigatebird *Fregata magnificens* (10), Kelp Gull (10), South American Tern *Sterna hirundinacea* (16), Cayenne Tern *Thalasseus sandvicensis eurygnathus*

(16), and Royal Tern *Thalasseus maximus* (6) (Sick 1997, Alves *et al.* 2004, Branco 2004, Campos *et al.* 2004, Efe 2004, Krul 2004, Yorio & Efe 2008). Human disturbance can result in an increased risk of egg and chick predation, nest desertion, reducing hatching success and increased stress for the birds. Not all sites will be used every year because birds may shift the location of breeding colonies in response to human disturbance.

Table 3. Inshore islands where seabirds breed, or formerly bred, in south-east and south Brazil. Species are Brown Booby *Sula leucogaster* (**BB**), Magnificent Frigatebird *Fregata magnificens* (**MF**), Kelp Gull *Larus dominicanus* (**KG**), South American Tern *Sterna hirundinacea* (**SA**), Sandwich Tern *Thalasseus sandicicensis* (**SD**), and Royal Tern *Thalasseus maximus*. The states are: Espírito Santo (**ES**), Rio de Janeiro (**RJ**), São Paulo (**SP**), Paraná (**PR**), and Santa Catarina (**SC**). The symbols mean: breeding not observed so far (–) and breeding confirmed (•).

Site name	State	Location	BB	MF	KG	SA	SD[1]	RT
Itatiaia Is.	ES	20°20'S, 40°16'W	–	–	–	•	•	–
Pacote Is.	ES	20°21S, 40°16'W	–	–	–	–	•	–
Escalvada I.	ES	20°42'S, 40°24'W	–	–	–	•	•	–
Branca I.	ES	21°00'S, 40°47'W	–	–	–	–	•	–
Papagaios I.	RJ	21°00'S, 40°47'W	–	–	–	•	•	–
Santana or Macaé Archpel.	RJ	22°24'S, 41°42'W	•	•	–	•	•	–
Laje dos trinta-réis I.	RJ	22°35'S, 41°57'W	–	–	–	–	–	•
Guanabara Bay Is.	RJ	22°48'S, 43°09'W	–	–	–	•	•	–
Cabo Frio I.	RJ	23°00'S, 41°00'W	•	•	•	–	–	–
Cagarras I.	RJ	23°02'S, 43°23'W	•	–	–	•	–	–
Redonda I.	RJ	23°04'S, 43°12'W	–	•	–	–	–	–
Cabra I.	SP	23°44'S, 45°02'W	•	–	–	–	–	–
Sumitica I.	SP	23°50'S, 45°09'W	•	–	–	–	–	–
Figueira I.	SP	23°55'S, 45°18'W	–	–	–	–	•	–
Codó I.	SP	23°55'S, 45°18'W	–	–	–	•	–	–
Alcatrazes Archipel.	SP	24°06'S, 45°42'W	•	•	•	–	–	–
Apara I.	SP	23°50S, 45°33'W	–	–	–	–	•	–
Prainha I.	SP	23°51S, 45°25'W	–	–	–	–	•	•
Amigo I.	SP	24°04'S, 45°39'W	–	–	–	–	–	•
Laje de Santos I.	SP	24°14'S, 46°16'W	•	–	•	•	•	•
Gaivota I.	SP	24°22'S, 46°48'W	–	–	–	–	–	•
Laje da Conceição I.	SP	24°14'S, 46°41'W	–	–	–	–	–	•
Guaraú I.	SP	24°23'S, 46°59'W	•	–	–	–	–	–
Queimada Grande I.	SP	24°29'S, 46 41'W	•	–	–	–	–	–
Bom Abrigo I.	SP	25°07'S, 47°51'W	•	–	–	–	–	–
Castilho I.	SP	25°17'S, 47°57'W	•	•	•	•	•	–
Figueira I.	PR	25°22'S, 48°02'W	•	•	–	–	–	–
Currais I.	PR	25°44'S, 48°22'W	•	•	•	•	–	–
Itacolomis Is.	PR	25°51'S, 48°24'W	•	•	–	–	–	–
Tamboretes Archipel.	SC	26°22'S, 49°31'W	•	–	•	–	–	–
Itacolomis Is.	SC	26°42'S, 48°37'W	–	–	•	•	•	–
Galé I.	SC	27°11'S, 48°25'W	–	•	–	–	–	–
Deserta I.	SC	27°16'S, 48°20'W	–	–	•	•	•	–
Cardos I.	SC	27°48'S,48°34'W	–	–	–	•	•	–
Moleques do Sul Is.	SC	27°51'S, 48°26'W	•	•	•	•	•	–
Fora I.	SC	28°21'S, 48°36'W	–	–	–	•	–	–
Galheta I.	SC	28°32'S, 48°45'W	–	–	•	•	–	–

[1] Refers to Cayenne Tern, the subspecies *Thalasseus sandicicensis eurygnathus*.

A small colony of Audubon's Shearwater (five nests) was observed in August 1993 on Itatiaia Islands, a costal rocky archipelago in Espírito Santo (Efe & Musso 2001). I am not aware of the current status of this colony, but since the islands are protected and a permit is required to land or secure boats, the population there has great chances to increase or at least keep stable. To my knowledge the Itatiaia archipelago is the southernmost nesting site of Audubon's Shearwater in the Atlantic Ocean (cf. Brooke 2004). Also, worthy of mention is that these islands are regarded as the largest nesting site of Cayenne Terns, where approximately 10,000-13,000 breed every year (Efe *et al.* 2000, Yorio & Efe 2009).

Kelp Gulls, South American Terns, Cayenne Terns and Royal Terns also breed in Uruguay and Argentina during the austral spring and summer (e.g. Yorio *et al.* 1994, 1998, Quintana & Yorio 1997). Based on analyses of data of seasonal abundance and plumage moult it can be concluded that at least in southernmost Brazil, where these species do not breed, they also occur as visitors from southern South America in austral winter months, especially May-July (Vooren & Chiaradia 1990, Bugoni & Vooren 2005). On the other hand, populations of Brazilian islands breed in April-August (e.g. Branco 2004, Previlltz *et al.* 2009). Brazilian population stocks are certainly genetically isolated from the Uruguayan and Argentinean ones, and thus are subject to different environmental and anthropogenic pressures.

Seven species breed on the continental coast or further inland. This group includes three gulls, three terns, and the Black Skimmer *Rhyncops niger* (Table 4). In southernmost Brazil, five species (Brown-hooded *Chroicocephalus maculipennis* and Grey-headed Gulls *Chroicocephalus cirrocephalus*, Trudeau's *Sterna trudeaui* and Yellow-billed Terns *Sternula superciliaris*, and Black Skimmer) breed on marshes, river beaches and islands, and lakes, but move to the coast during the non-breeding season (Belton 1984, Vooren & Chiaradia 1990, Efe *et al.* 2001). In the same region, a mixed colony with a few pairs of Large-billed *Phaetusa simplex*, Gull-billed *Gelochelidon nilotica*, and Yellow-billed Terns *Sternula superciliaris* were observed once at Lagoa do Peixe National Park in early November 1986 (Antas 1991). I spent two years (2005–2006) working in this Park, but was unable to record any breeding activity of these species. However, I observed juvenile Large-billed Terns being fed by adults on 1 April 2006 (C.J. Carlos & C.E. Fedrizzi, unpubl. data), suggesting that at least this species still breeds there or on nearby areas.

In other regions of the country, like the Amazon basin, Large-billed, Yellow-billed Terns and Black Skimmers breed in loose groups on sandbanks and sandy beaches of major rivers (Sick 1997). I am not aware of any published information about breeding of these species on coastal areas outside Rio Grande do Sul, but it may also occur on coastal marshes, lagoons and sandbars of the northern and north-eastern region, as previously suggested by Antas (1991). Grey-headed Gulls (Figure 4) and Gull-billed Terns are reported to breed between April–June on salt pans on the northern coast of the State of Rio Grande do Norte (Azevedo-Júnior *et al.* 2004). Mangroves and salt-works are a conspicuous feature on the northern coast of the States of Rio Grande Norte and Ceará. The shallow tanks support large biomass of Brine shrimps (*Artemia* sp.), which serves as food for waterbirds (especially shorebirds), while sandbanks amidst the ponds provide nesting and roosting sites.

Table 4. Seabird species breeding on the continental coast or inland ecosystems of Brazil. The states are: Rio Grande do Sul (RS), Bahia (BA), Rio Grande do Norte (RN), Maranhão (MA), Pará (PA), and Amapá (AP). The symbols mean: breeding not observed so far (–); breeding confirmed (•); breeding was suggested, but not confirmed (?).

Species (English/Scientific names)	RS	BA	RN	CE	PI	MA	PA	AP
Brown-hooded Gull *Chroicocephalus maculipennis*	•	–	–	–	–	–	–	–
Grey-headed Gull *Chroicocephalus cirrocephalus*	•	–	•	?	–	–	–	–
Laughing Gull *Leucophaeus atricilla*	–	–	–	?	?	•	–	–
Least Tern *Sternula antillarum*	–	–	?	?	?	•	?	–
Yellow-billed Tern *Sternula superciliaris*	•	•	?	?	?	?	?	?
Large-billed Tern *Phaetusa simplex*	•	–	?	–	?	?	?	?
Gull-billed Tern *Gelochelidon nilotica*	•	–	•	?	?	?	?	?
Snowy-crowned Tern *Sterna trudeaui*	•	–	–	–	–	–	–	–
Black Skimmer *Rhyncops niger*	•	–	–	–	–	•	•	•

Until very recently, Laughing Gull *Leucophaeus atricilla* (Figure 5) and Least Tern *Sternula antillarum* were considered to be migrants from North America (Sick 1997, Vooren & Brusque 1999). However, these two seabirds were found breeding on sandy beaches on the northern Brazilian coast (Rodrigues 2008, A.A.F. Rodrigues pers. comm.). Breeding of Laughing Gull and Least Tern is also likely to occur on lagoons and associated swamps in coastal areas of Piauí-Ceará, but this needs more fieldwork. Although Brazil harbours breeding populations of Laughing Gull and Least Tern, a few birds ringed in North America have been recovered in the country (Olmos 2002a), thus indicating that migrant birds mix with resident ones at least on the northern and north-eastern coasts.

Figure 4. Grey-headed Gull *Chroicocephalus cirrocephalus*, Rio Grande do Norte, north-east Brazil, 25 February 2005. *Photo:* C. Albano.

Figure 5. Laughing Gulls *Leucophaeus atricilla* and one Large-billed Tern *Phaetusa simplex*, Maranhão, north Brazil, February 2007. *Photo:* F. Olmos.

Non-breeding seabirds in Brazil. Non-breeding seabirds in Brazil (both migratory and vagrants) comprise 67 species. This group includes four penguins (three are vagrants), 10 albatrosses (five vagrants), 20 petrels (five vagrants), three storm-petrels (two vagrants), one vagrant diving-petrel, one vagrant tropicbird, one vagrant pelican, two vagrant gannets, one vagrant sheathbill, six skuas, five gulls (three vagrants), and six terns (two vagrants). Twenty-eight migrant species originate from the Southern South America, sub-Antarctic islands and the Antarctic continent, and 13 from the North Hemisphere.
Migratory seabirds can be divided into coastal and pelagic species. Costal species are mainly terns and gulls, while pelagic ones are albatrosses, petrels and skuas. Coastal migrants are: Laughing Gull, Olrog's Gull *Larus atlanticus*, Least Tern, Common Tern *Sterna hirundo*, and Roseate Tern *S. dougallii*. All but Olrog's Gull are migrants from North America. Laughing Gulls and Least Terns are abundant on the northern and north-eastern coasts (Rodrigues 2008, Girão *et al.* 2008, C. J. Carlos unpubl. data), but most birds seen there are likely to be breeding populations. Kelp Gulls, South American Terns, Cayenne Terns, and Royal Terns breed in Brazil, but birds from Uruguay/Argentina migrate to southern Brazil in the winter.

Large flocks (12,000-14,000 birds) of Common Terns (Figure 6) have been recorded in Lagoa do Peixe National Park (31°14'S, 51°00'W) in the extreme south of the country (e.g. Harington *et al.* 1986, Lara-Resende 1988). This species also concentrates along other parts of the Brazilian coast, generally near food-rich wetland areas. Until recently, the wintering grounds of North-American Roseate Terns were virtually unknown. However, the combined work of Brazilian and American ornithologists (e.g. Hays *et al.* 1997, 1999, Lima *et al.* 2006), identified Mangue Seco (11°27'S, 37°27'W) in the State of Bahia as an important site for

this species. Common Terns also concentrate abundantly at this point. Surprisingly, part of the Common Tern population from the Azores archipelago in the North Atlantic winters in Mangue Seco, thus making transatlantic migration (Hays *et al.* 1997, 1999).

Figure 6. Common Tern *Sterna hirundo*, Rio Grande do Norte, north-east Brazil, 22 October 2005. *Photo:* C. Albano.

Most pelagic migrants (78%) are from the Antarctic and sub-Antarctic regions. This group includes one penguin, five albatrosses, 12 petrels, one storm-petrel, and three skuas. Only six pelagic migrants (Cory's Shearwater *Calonectris borealis*, Cape Verde Shearwater *C. edwardsii*, Manx Shearwater *Puffinus puffinus*, Leach's Storm-petrel *Oceanodroma leucorhoa*, Great Skua *Stercorarius skua*, and Arctic Tern *Sterna paradisea*) come from the Northern Hemisphere.

The sources of some pelagic migratory species are easy to identify. For example, Tristan Albatross *Diomedea dabbenena* and Spectacle Petrels *Procellaria conspicillata* breed respectively on Gough and Inaccessible Islands, both in the South Atlantic. The two species are common visitors in winter to off-shore waters of south-east and south Brazil (Neves & Olmos 2001, Olmos 1997, 2001, Dénes *et al.* 2007). Other species (e.g. Giant Petrels *Macronectes* spp.) have many breeding sites and birds found in Brazil may come from different breeding populations, as shown by ring recoveries (Olmos 2002a).

In the South Atlantic and adjacent Southern Ocean, pelagic seabirds (penguins, petrels, and skuas) breed on four major regions, based on geographical proximity and similarities of the avifauna: (1) Southern Patagonia/Falkland Islands, (2) South Georgia/South Orkneys/South Sandwich Islands, (3) Tristan da Cunha/Gough Islands, and (4) the Antarctic Peninsula and continent (Table 5). The number of seabird species occurring habitually (excluding the vagrants) in each of these regions is as follows: S. Patagonia/Falkland Is. (10 out of 18 spp.),

S. Georgia/South Orkneys/South Sandwich Is. (11 out of 21 spp.), Tristan da Cunha/Gough Is. (8 out of 15 spp.), Antarctic Peninsula and continent (8 out of 18 spp.). (Table 5) Among the group of pelagic migrants from the Antarctic and sub-Antarctic, only one species, the Southern Royal Albatross *Diomedea epomophora*, breeds outside of Atlantic Ocean. This species breeds in New Zealand, but non-breeding birds forage on the west and east coast South America (Marchant & Higgins 1990, Brooke 2004).

Table 5. Number of pelagic seabird species breeding on Southern Patagonia/Falkland Is. (SPF), South Georgia/South Orkneys/South Sandwich Is (SGOS), Tristan da Cunha/Gough Is. (TCG), and Antarctic Peninsula and continent (APC) regions, and their status in Brazil: VA – Vagrants, MS – Migrants from Southern South America, sub-Antarctic and Antarctic regions. The symbols mean: breeding not observed so far (-); breeding confirmed (•).

Species (English/scientific names)	Status	SPF	SGOS	TCG	APC
King Penguin *Aptenodytes patagonicus*	VA	•	•	–	–
Emperor Penguin *Aptenodytes forsteri*		–	–	–	•
Gentoo Penguin *Pygoscelis papua*		•	•	–	•
Chinstrap Penguin *Pygoscelis antarcticus*		–	•	–	•
Magellanic Penguin *Spheniscus magellanicus*	MS	•	–	–	–
Macaroni Penguin *Eudyptes chrysolophus*	VA	•	•	–	•
Rockhopper Penguin *Eudyptes chrysocome*	VA	•	•	•	•
Sooty Albatross *Phoebetria fusca*	VA	–	–	•	–
Light-mantled Albatross *Phoebetria palpebrata*	VA	–	•	–	–
Atlantic Yellow-nosed Albatross *Thalassarche chlororhynchos*	MS	–	–	•	–
Black-browed Albatross *Thalassarche melanophris*	MS	•	•	–	–
Grey-headed Albatross *Thalassarche chrysostoma*	VA	–	•	–	–
Southern Giant-Petrel *Macronectes giganteus*	MS	•	•	•	•
Northern Giant-Petrel *Macronectes halli*	MS	–	•	–	–
Southern Fulmar *Fulmarus glacialoides*	MS	–	•	–	•
Antarctic Petrel *Thalassoica antarctica*		–	–	–	•
Cape Petrel *Daption capense*	MS	–	•	–	•
Snow Petrel *Pagodroma nivea*		–	–	–	•
Kerguelen Petrel *Lugensa brevirostris*	VA	–	–	•	•
Soft-plumaged Petrel *Pterodorma mollis*	MS	–	–	•	–
Atlantic Petrel *Pterodroma incerta*	MS	–	–	•	–
Great-winged Petrel *Pterodroma macroptera*	VA	–	–	•	–
Blue Petrel *Halobaena caerulea*	MS	•	•	–	–
Fairy Prion *Pachyptila turtur*		•	–	–	–
Broad-billed Prion *Pachyptila vittata*	VA	–	–	•	–

Antarctic Prion *Pachyptila desolata*	MS	–	•	–	•
Slender-billed Prion *Pachyptila belcheri*	MS	•	–	–	–
Grey Petrel *Procellaria cinerea*	VA	–	–	•	–
White-chinned Petrel *Procellaria aequinoctialis*	MS	•	•	–	–
Spectacled Petrel *Procellaria conspicillata*	MS	–	–	•	–
Sooty Shearwater *Puffinus griseus*	MS	•	–	–	–
Greater Shearwater *Puffinus gravis*	MS	–	–	•	–
Little Shearwater *Puffinus assimilis*		–	–	•	–
White-bellied Storm-Petrel *Fregetta grallaria*	MS	–	–	•	–
Black-bellied Storm-Petrel *Fregetta tropica*	VA	–	•	–	•
Wilson's Storm-Petrel *Oceanites oceanicus*	MS	•	•	–	•
Gray-backed Storm-Petrel *Garrodia nereis*		•	•	–	–
White-faced Storm-Petrel *Pelagodroma marina*[2]	VA	–	–	–	•
Common Diving-Petrel *Pelecanoides urinatrix*		•	–	–	–
South Georgia Diving-Petrel *Pelecanoides georgicus*			•	–	–
Magellanic Diving-Petrel *Pelecanoides magellani*	VA	•	–	–	–
Chilean Skua *Stercorarius chilensis*	MS	•	–	–	–
South Polar Skua *Stercorarius maccormicki*	MS	–	–	–	•
Southern Skua *Stercorarius antarcticus*	MS	•	•	•	•

[1]Species currently placed on the Hypothetical List;
[2] The single Brazilian specimen refers to subspecies *P. m. hypoleuca* from Madeira and Canaries archipelagos in North Atlantic.

Antarctic and sub-Antarctic migrants, especially those from Tristan da Cunha/Gough and Patagonia/Falkland Is., have in the Brazilian waters between 23-34°S, one of their main feeding grounds (e.g. Vooren & Brusque 1999, Carlos 2006). Spectacled Petrels of Tristan da Cunha (Figure 7) disperse to the waters off south-east and south Brazil (Olmos 1997, Neves *et al.* 2006), with relatively small numbers recorded off the west coast of southern Africa (Camphuysen & Van Der Meer 2000). The Falkland Islands hold over three quarters of the world population of Black-browed Albatross *T. melanophris* (Gales 1998). After breeding, birds from the Falklands winter on the Patagonian Shelf, but immature birds forage mainly in Brazilian waters (Olmos 1997, Carlos 2006, Neves *et al.* 2006).

Pelagic migrants from the Northern Hemisphere nest on islands roughly located between Iceland (c. 60°N) and Cape Verde archipelago (c. 15°N). Two species are common and abundant off Brazil: Cory's and Manx Shearwaters. Cory's Shearwater breeds on the Azores Canary Islands, and the Madeira group and is known to migrate across the Atlantic towards waters off southern Brazil, Uruguay and Argentina (Cooke & Mills 1977, Brooke 2004) The species mainly occurs in eastern Brazil during the summer and autumn, January–May, but there are several winter (July) records. Manx Shearwaters are more abundant off eastern Brazil in spring, October–November, while en route to their wintering quarters off Southern South

America (Brooke 1990, 2004). Until very recently, Cape Verde Shearwaters were known in Brazil from a handful of sight records and museum specimens (Petry *et al.* 2000, Lima *et al.* 2002, Olmos 2002d). However, recent at sea observations and beach surveys have shown that this species is a regular visitor to off-shore waters of eastern Brazil, in a pattern similar to that described for Cory's Shearwaters (Olmos & Bugoni 2006, C. J. Carlos, L. Bugoni & C. E. Fedrizzi in prep.). Leach's Storm-petrels are frequent seen in off-shore waters of north-eastern Brazil in the summer, January-March.

Twenty-six species are currently considered as vagrants to Brazil, most of which are from the sub-Antarctic and Antarctic regions. One species, White-faced Storm-petrel *Pelagodroma marina*, breeds on islands of the North and South Atlantic (Marchant & Higgins 1990, Brooke 2004), but according to Lima *et al.* (2002) the single Brazilian specimen refers to the subspecies *hypoleuca* of Madeira and Canaries archipelagos.

Figure 7. Tristan Albatross *Diomedea dabbenena*, Spectacled Petrels *Procellaria conspicillata* and other seabirds off Santa Catarina, southern Brazil; August 1999. *Photo:* F. Olmos.

Discussion

Besides harbouring several seabird breeding colonies, Brazil is visited by many species from both the Northern Hemisphere and Southern Ocean and Antarctic region. However, what the numbers presented in this work really mean in relation to the seabird diversity in the Atlantic and world-wide? In order to make an assessment of the relative importance of Brazil to seabirds, I will compare the number of procellariiforms in the country with the number of species in the world and the number of species breeding on the Atlantic Ocean (Marchant & Higgins 1990, Brooke 2004). The reason why I choose the procellariiforms for this analysis is because they are the most species-rich order of seabirds (e.g. Brooke 2001, 2004).

As shown before, 40 species of albatrosses and petrels have at least one documented record from Brazil. It corresponds to 32.8% of the world's diversity of procellariiforms (125 spp.: Brooke 2001, 2004). This number of species is significant because the Economic Exclusive Zone of Brazil, with 4.5 million km² (Brazilian Continental Shelf Survey Project 2004), covers only a small fraction (1.2%) of the surface area (361 million km²) of all oceans. Of course, not all species are common and abundant in Brazil. According to the check-list of the Brazilian Committee of Ornithological Rrecords (2008), 13 (26.5%) procellariiform species are vagrants to the country. However, only recently the status of many seabirds has become better known, and species once considered merely as rare or accidentals in Brazil (e.g. Tristan Albatross, Spectacled Petrel, and Northern Giant Petrels *Macronectes halli*, Pomarine Skua *Stercorarius pomarinus*) are indeed regular members of the country's avifauna (Martuscelli *et al.* 1995, Olmos 1997, 2000, 2002c, Neves & Olmos 2001, Bugoni *et al.* 2003, Carlos *et al.* 2005, Dénes *et al.* 2007).

Fifty-one species of albatrosses and petrels breed on islands distributed from the North Atlantic to Antarctic region, 36 (70.6%) of which have been confirmed in Brazil. This percentage speaks for itself and does not require any explanation. Most species without Brazilian records either migrate to waters off western and southern Africa (e.g. European Storm-petrel *Hydrobates pelagicus*) or tend to feed inshore and rarely disperse far from their breeding colonies, e.g. Diving Petrels *Pelecanoides* spp. (Marchant & Higgins 1990, Brooke 2004). For other species, like Black-capped Petrel which now breeds in Haiti and the Dominican Republic, the Brazilian records should still be confirmed by tangible evidence (Brazilian Committee of Ornithological Records 2000, 2008). Worth of mention is that Brazil holds the only breeding colony of Trindade and Kermadec Petrels in the Atlantic. A gadfly petrel species breeding on Round Island in the Indian Ocean may refer to Trindade or Herald Petrels *Pterodroma heraldica* (Brooke *et al.* 2000). Depending on the taxonomic status of birds from Round Island, Trindade may be the only site of the world where Trindade Petrels breed.

In my comparisons, I did not include five species that do not breed in the Atlantic, but occur in Brazil, namely, Southern Royal Albatross *Diomedea epomophora*, Northern Royal Albatross *D. sanfordi*, Shy Albatross *Thalassarce cauta*, White-headed Petrel *Pterodroma lessonii* and Short-tailed Shearwater *Puffinus tenuirostris*. Southern Royal Albatross is a regular visitor in winter to waters off south-east and south Brazil, and the same is probably true for Northern Royal and Shy Albatrosses (Petry *et al.* 1991, Olmos 2002b, Carlos *et al.* 2004, Lima *et al.* 2004, Dénes *et al.* 2007).

The analysis above, although simple, demonstrates clearly that Brazilian waters are important not only for Atlantic and Antarctic seabirds but also for birds from distant lands like Australia and New Zealand. Here seabird species find suitable areas to forage along the coastline and inshore and off-shore waters, and many sites for nesting.

Seabirds evolved to exploit different food resources in the world's oceans. Therefore, species tend to concentrate in areas of high biological production in temperate–polar latitude waters or areas of cold, persistent boundary currents flowing toward the equator, such as the Benguela in Africa and the Humboldt of western South America (Murphy 1936, Warhan 1990, Brooke 2004). Oceanographic conditions off Brazilian coast during most of the year are greatly

influenced by the warm South Equatorial and Brazil currents, thus resulting in waters of relatively low productivity (Longhurst & Pauly 1987).

In the winter, strong southerly winds blow along the coast of South Brazil. As a result, the cold and nutrient rich Falkland current extends northward and dominates waters off south Brazil (Castello & Moeller 1977, Garcia 1998), but not infrequently it reaches as far north as 23°S in the south-east (Campos *et al.* 1996). This phenomenon, associate with discharge of La Plata River and Patos Lagoon system, causes an increase of the biological production and a rapid influx of Antarctic and sub-Antarctic organisms, including seabirds, in the shelf waters of southern Brazil (e.g. Murphy 1936, Palacio 1982, Carlos 2006). This explains why this region contains the highest number of seabird species, and the largest breeding colonies. Breeding of seabirds of inshore islands of south-east and south Brazil occurs mainly in the winter at a time when there is much food available in the environment.

North of 23°S, biological productivity is linked to the discharge of major rivers and lagoons. Several estuaries are located along the Brazilian coastline and coastal ecosystems associated to them (mangroves, sandy beaches, etc.) provide habitats to seabirds. Important areas include, for example, the huge Amazon River estuary, mouth of Parnaíba and São Francisco Rivers, and the Iguape–Cananéia–Paranaguá Estuary. Local upwellings foster fish populations in north-east and south-east Brazil and around oceanic islands and seamounds (Longhurst & Pauly 1987), including Saint Peter and Saint Paul and Fernando de Noronha Archipelagos and Trindade Island. All are important for seabirds, especially the tropical species (eg Figatebirds and Bobbies), and some probably support the large concentrations of migrant species like terns. Seabirds spend most of their life at sea, often foraging far away from their nesting sites. Other species undertake long-distance migrations over thousands of kilometers. While foraging and/or migrating seabirds are at risk of being killed by fisheries and affected by oil spills and other pollution. Longline fisheries operating off south Brazil are known to kill many threatened species, such as Wandering, Tristan, Black-browed and Atlantic Yellow-nosed Albatrosses. The observed population decline of these species is mainly a result of heavy incidental mortality in longline fisheries (Neves & Olmos 1998, Olmos *et al.* 2001, Neves *et al.* 2007), and the Brazilian fishing fleet has it share in this decline. Continuing loss and degradation of coastal habitats has direct impacts on seabirds, especially long-distance migrants like Common and Roseate Terns. On islands, alien invasive species, notably rats, prey mainly upon seabird eggs and chicks, thus reducing seabird population abundance. This is a serious problem on the main island of Fernando de Noronha where rats, cats, dogs and Tegu Lizards prey on ground-nesting seabirds and their eggs.

Brazil has a great responsibility in the conservation of many seabird species from different geographical regions. However, there are still few conservation programmes involving this group of birds in the country. In June 2006, the Brazilian government launched, with support of BirdLife International, a national action plan for the conservation of albatrosses and petrels, aiming to protect nesting sites of resident procellariiforms and implement actions to reduce the incidental catch of seabirds by the longlines (Neves *et al.* 2006). More recently, the Brazilian Ministry of Environment has recently launched a committee to develop, up to the end of 2009, a conservation plan for the threatened non-Procellariformes seabirds occurring in Brazilian waters. Species included are: the two Red-billed and White-tailed Tropicbirds, Greater and Lesser Frigatebirds, and Cayenne and Royal Terns.

The challenge of seabird conservation in Brazil is even greater because many islands where seabirds breed are not adequately protected, and important coastal habitats (e.g. mangroves, saltmarshes, dunes, lagoons, and sandy beaches) have suffered from several hundred years of degradation from human impacts. Most negative coastal and estuarine habitat impacts are the result of coastal development, as residential, commercial and industrial land use in coastal areas has intensified.

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References

Ab'Saber, A. N. (2001). *Litoral do Brasil - Brazilian coast*. Metalivros, São Paulo.

Alves, V. S., Soares, A. B. A., Couto, G. S., Efe, M. A & Ribeiro, A. B. B. (2004). *Aves marinhas de Abrolhos - Bahia, Brasil*. Pp. 213–232 *in*: Branco, J. O. (org.) Aves marinhas e insulares brasileiras: bioecologia e conservação. Editora Univali, Itajaí.

Antas, P. T. Z. (1991). *Status and conservation of seabirds breeding in Brazilian waters*. Pp. 141–158 *in*: Croxall, J. P. (Ed.). Seabirds status and conservation: a supplement. International Council for Bird Preservation (ICBP Tech. Publ. 1), Cambridge, UK.

Azevedo-Júnior, S. M., Larrazábal, M. E. Pena, O. (2004). *Aves aquáticas de ambientes antrópicos (salinas) do Rio Grande do Norte, Brasil*. Pp. 255–266 in: Branco, J. O. (org.) Aves marinhas e insulares brasileiras: bioecologia e conservação. Editora Univali, Itajaí.

Belton, W. (1984). *Birds of Rio Grande do Sul, Brazil part 1. Rheidae through Furnariidae*. Bulletin of the American Museum of Natural History 178: 369–636.

BirdLife International (2004) *Threatened birds of the world 2004*. CD-ROM. BirdLife International, Cambridge, UK.

Branco, J. O. (2004). *Aves marinhas das Ilhas de Santa Catarina*. Pp. 15-36 *in*: Branco, J. O. (org.) Aves marinhas e insulares brasileiras: bioecologia e conservação. Editora Univali, Itajaí.

Brazilian Committee of Ornithological Records (2000). *Deliberações do CBRO*. Nattereria 1: 34.

Brazilian Committee of Ornithological Records (2008). *Checklist of the birds of Brazil*. Version 05/10/2008. Available at <http://www.cbro.org.br>. (Accessed on 31 March 2009).

Brazilian Continental Shelf Survey Project (2004). *Continental shelf and UCLOS article 76: Brazilian submission*. Brazilian Continental Shelf Survey Project, Rio de Janeiro.

Both, R. & Freitas T. R. O. (2004). *Aves marinas no Arquipélago de São Pedro e São Paulo*. Pp. 193–212 *in*: Branco, J. O. (org.) Aves marinhas e insulares brasileiras: bioecologia e conservação. Editora Univali, Itajaí.

Brooke, M. L. (1990). *The Manx Shearwater*. Academic Press, London.

Brooke, M. L. (2001). *Systematics and distribution of seabirds of the world: a review of current knowledge*. Pp. 57-83 *in*: Schreiber, E. A. & Burger, J. (eds.) The biology of marine bird CRC Press, Boca Raton.

Brooke, M. L. (2004). *Albatrosses and petrels across the world*. Oxford University Press, Oxford, UK.

Brooke, M. L., Imber, M. J. & Rowe, G. (2000). *Occurrence of two surface breeding species of Pterodroma on Round Island. Ibis* 138: 420–438.

Bugoni, L. Neves, T. S., Adornes, A. C., Olmos, F. & Barquete, V. (2003). *Northern Giant Petrels Macronectes halli in Brazil*. Atlantic Seabirds 5: 127-129.

Bugoni, L. & Vooren, C. M. (2005). *Distribution and abundance of six tern species in southern Brazil*. Waterbirds 28: 110–119.

Camphuysen, C. J. & Van Der Meer, J. (2000). *Notes on the distribution of the Spectacled Petrel Procellaria conspicillata in the South Atlantic Ocean*. Atlantic Seabirds 2: 13–18.

Campos, F., Paludo, D., Faria, P. & Martuscelli, P. (2004). *Aves insulares marinhas, residentes e migratórias, do litoral do Estado de São Paulo*. Pp. 233–254 *in*: Branco, J. O. (org.) Aves marinhas e insulares brasileiras: bioecologia e conservação. Editora Univali, Itajaí.

Campos, E. J. D., Lorenzetti, J. A., Stevenson, M. R., Stech, J. L. & Souza, R. B. (1996). *Penetration of waters from Brazil–Malvinas confluence along South American continental shelf up to 23°S*. Anais da Academia Brasileira de Ciências 68(Supl.1): 49–58.

Carlos, C. J. (2006). *As aves Procellariiformes do Brasil: catálogo, distribuição geográfica e padrão sazonal das ocorrências*. M.Sc. Thesis. Fundação Universidade Federal do Rio Grande, Rio Grande.

Carlos, C. J., Colabuono, F. E. & Vooren, C. M. (2004). *Notes on the Northern Royal Albatross Diomedea sanfordi in south Brazil*. Ararajuba: Revista Brasileira de Ornitologia 12: 166–167.

Carlos, C. J., Voisin, J.-F. & Vooren, C. M. (2005). *Records of Southern Giant Petrel Macronectes giganteus solanderi and Northern Giant Petrel M. halli off southern Brazil*. Bulletin of the British Ornithologists' Club 125: 288–292.

Castello, J. P. & Moller, O. O. (1977). *On the oceanographic conditions in the Rio Grande do Sul state.* Atlântica 2: 25–110.

Cooke, F. & Mills, E. L. (1977). *Summer distribution of pelagic birds off the coast of Argentina.* Ibis 114: 245–251.

Dénes, F. V., Carlos, C. J. & Silveira, L. F. (2007). *The albatrosses of the genus Diomedea Linnaeus, 1758 in Brazil.* Revista Brasileira de Ornitologia 15: 543–550.

Efe, M. A., Bugoni, L., Mohr, L. V., Scherer, A, Scherer, S. B. & Bairro, O. P. (2001). *First-known Record of breeding for the Black Skimmer (Rhyncops niger) in a mixed colony in Ibicuí river, Rio Grande do Sul state, southern Brazil.* International Journal of Ornithology 4: 103–107.

Efe, M.A. & Musso, C.M. (2001). *Primeiro registro de Puffinus lherminieri Lesson,* 1839 no Brasil. Nattereria 2: 21–23.

Efe, M. A., Nascimento, J. L. X., Nascimento, I. L. S. & Musso, C. M. (2000). *Distribuição e ecologia reprodutiva de Sterna sandvicensis eurygnatha no Brasil. Melopsittacus* 3: 110–121.

Fonseca-Neto, F. P. (2004). Aves marinhas da ilha Trindade. Pp. 119-146 *in*: Branco, J.O. (org.) *Aves marinhas e insulares brasileiras: bioecologia e conservação.* Itajaí: Editora da Univali.

Garcia, C. A. E. (1998). *Características Hidrográficas.* Pp. 18–21 *in*: Seeliger, U., Odebrecht, C. & Castello, J. P. (eds.) Os ecossistemas costeiro e marinho do extremo sul do Brasil. Editora Ecoscientia, Rio Grande.

Gales, R. (1998). *Albatross population: status and threats.* Pp. 20–45 *in*: Robertson, G. &

Gales, R. (eds.) *Albatross biology and conservation.* Surrey Beatty & Sons, Chipping Norton.

Girão, W., Albano, C., Campos, A. A., Pinto, T. & Carlos, C. J. (2008). *Registros documentados de cinco novos trinta-réis (Charadriiformes: Sternidae) no estado do Ceará, nordeste do Brasil.* Revista Brasileira de Ornitologia 16: 252-255.

Harrington, B., Antas, P. T. Z. & Silva, F. (1986). *Observations of Common Terns in South Brazil.* Journal of Field Ornithology 57: 222–224.

Hays, H., DiCostanzo, J., Cormons, G., Antas, P. T. Z., Nascimento, J. L. X., Nascimento, I. L. S. & Bremer, R. E. (1997). *Recoveries of Roseate and Common Terns in South America.* Journal of Field Ornithology 68: 79-90.

Hays, H., Lima, P., Monteiro, L., DiCostanzo, J., Cormons, G., Nisbet, I. C. T., Saliva, J. E., Spendelow, J. A., Burguer, J., Pierce, J. & Gochfeld, M. (1999). *A nonbreeding concentration of Roseate and Common Terns in Bahia Brazil.* Journal of Field Ornithology 70: 455–464.
Instituto Brasileiro de Geografia e Estatística (1977). Geografia do Brasil, 4 vols. Instituto Brasileiro de Geografia e Estatística, Rio de Janeiro.

Imber, M. C. (2004). *Kermadec petrels (Pterodroma neglecta) at Ilha da Trindade, South Atlantic Ocean and in the North Atlantic.* Notornis 51: 33–40.

Lara-Resende, S. M. (1988). *Nonbreeding strategies of migratory birds at Lagoa do Peixe, Rio Grande do Sul, Brazil.* M.Sc. Thesis. Cornell University, Ithaca.

Krul, R. (2004). *Aves marinhas costeiras do Paraná.* Pp. 37–56 *in*: Branco, J.O. (org.) Aves marinhas e insulares brasileiras: bioecologia e conservação. Itajaí: Editora da Univali.

Lima, P. C., Grantsau, R., Lima, R. C. R. & Santos, S. S. (2002). *Notas sobre os registros brasileiros de Calonectris edwardsii* (Oustalet, 1883) e Pelagodroma marina hypoleuca (Moquin-Tandon, 1841) e primeiro registro de Phalacrocorax bransfieldensis Murphy, 1936 para o Brasil. Ararajuba: Revista Brasileira de Ornitologia 10: 263–265.

Lima, P. C., Grantsau, R., Lima, R. C. R. & Santos, S. S. (2004). *Primeiro registro para o nordeste brasileiro do Albatroz-de-cabeça-cinza (Diomedea c. cauta* Gould, 1841). Atualidades Ornitológicas 118: 3.

Lima, P. C., Hays, H. Lima, R. C. F. R., Cormons, T., Cormons, G. DiCostanzo, J. & Santos, S. S. (2006). *Recuperações de Sterna hirundo (Linnaeus, 1758) na Bahia, Brasil, entre 1995 e 2004.* Revista Brasileira de Ornitologia 13: 177–179.

Longhurst, A. R. & Pauly, D. (1987). *Ecology of tropical oceans.* Academic Press. London

Marchant, S. & Higgins, P. J. [coords.] (1990). *Handbook of Australian, New Zealand, and Antarctic birds*, vol. 1. Melbourne: Oxford University Press.

Martuscelli, P., Olmos, F. & Silva e Silva, R. 1995. *First record of the Northern Giant Petrel Macronectes halli* for Brazilian waters. *Bulletin of the British Ornithologists' Club* 115: 187–189.

Ministério do Meio Ambiente (2003). *Lista nacional das espécies da fauna brasileira ameaçadas de extinção.* Available at <http://www.mma.gov.br/port/sbf/fauna/index.cfm> (Accessed on 17 May 2009).

Ministério do Meio Ambiente (2006). *Programa REVIZEE: avaliação do potencial sustentável de recursos vivos na zona econômica exclusiva (Relatório Executivo).* Ministério do Meio Ambiente, Brasília.

Murphy, R. C. (1936). *Oceanic birds of South America*, 2 vols. American Museum of Natural History, New York.

Neves, T., Mancini, P. L., Nascimento, L., Miguéis, A. M. B. & Bugoni, L. (2007). *Overview by seabird bycatch by Brazilian fisheries in the South Atlantic Ocean.* Collective Volume of Scientific Papers ICCAT 60: 2085–2093.

Neves, T. S. & Olmos, F. (1998). *Albatross mortality in fisheries off the coast of Brazil. Pp.*

214-219 in: Robertson, G. & Gales, R. (eds.) Albatross biology and conservation. Surrey Beatty & Sons, Chipping Norton.

Neves, T. S. & Olmos, F. (2001) O *Albatroz-de-Tristão Diomedea dabbenena no Brasil.* Nattereria 2: 28–30.

Neves, T. S., Olmos, F., Peppes, F. & Mohr, L. V. (2006). *Plano de ação nacional para a conservação de albatrozes e petréis.* Edições IBAMA, Brasília.

Neves, T., Vooren, C. M., Bugoni, L. & Nascimento, L. (2006). *Distribuição e abundância de aves marinhas na região sudeste–sul do Brasil.* Pp. 11-35 *in*: Neves, T. S., Bugoni, L. & Rossi-Wongtschowski, C. L. B. (eds.) Aves oceânicas e suas interações com a pesca na região sudeste–sul do Brasil. Instituto Oceanográfico–USP (Série documentos REVIZEE: Score Sul), São Paulo.

Novaes, F. C. (1952). *Resultados ornitológicos da "Expedição João Alberto" à ilha da Trindade.* Revista Brasileira de Biologia 12: 219-228.

Olmos, F. (1997). *Seabird flocks attending bottom long-line fishing off southeastern Brazil.* Ibis 139: 685–691.

Olmos, F. (2000). *Revisão dos registros de Stercorarius pomarinus no Brasil, com notas sobre registros de S. longicaudus e S. parasiticus (Charadriiformes: Stercorariidae).* Nattereria 1: 29–33.

Olmos, F. (2001). *Revisão dos registros de Procellaria conspicillata (Procellariidae: Procellariiformes) no Brasil, com novas observações sobre sua distribuição.* Nattereria 2: 25–27.

Olmos, F. (2002a). *Non-breeding seabirds in Brazil: a review of band recoveries.* Ararajuba: Revista Brasileira de Ornitologia 10: 31–42.

Olmos, F. (2002b) *First record of Northern Royal Albatross (Diomedea sanfordi) in Brazil.* Ararajuba: Revista Brasileira de Ornitologia 10: 271–272.

Olmos, F. (2002c) *Pomarine Jaegers Stercorarius pomarinus wintering off Brazil.* Atlantic Seabirds 4: 73-76.

Olmos, F. (2002d). *At-sea records of Cape Verde Shearwaters Calonectris edwardsii in Brazil.* Atlantic Seabirds 4: 77–80.

Olmos, F. & Bugoni, L. (2006). *Agregações de aves marinhas associadas à pesca de espinhel-de-fundo na região sudeste–sul do Brasil.* Pp. 69-81 *in*: Neves, T. S., Bugoni, L. & Rossi-Wongtschowski, C. L. B. (eds.) Aves oceânicas e suas interações com a pesca na região sudeste–sul do Brasil. Instituto Oceanográfico–USP (Série documentos REVIZEE: Score Sul), São Paulo.

Olmos, F., Neves, T. S. & Bastos, G. C. (2001). *A pesca com espinhéis e a mortalidade de aves marinhas no Brasil.* Pp.327–337 *in*: Albuquerque, J. L., F. Cândido-Jr., J., Straube, F.C. & Ross,

Olson, S. L. (1981). *Natural history of vertebrates on the Brazilian islands of the mid South Atlantic.* National Geography Society Research Reports 13: 481–492.

Palacio, F. J. (1982). *Revisión biogeográfica marina del sur del Brasil.* Boletim do Instituo Oceanográfico, São Paulo 31: 69-92.

Petry, M. V., Bencke, G. A. & Klein, G. N. (1991). *First record of the Shy Albatross Diomedea cauta for the Brazilian coast.* Bulletin of the British Ornithologists' Club 111: 189–190.

Petry, M. V., Bugoni, L. & Fonseca, V. S. S. (2000). *Occurrence of the Cape Verde Shearwater Calonectris edwardsii on the Brazilian coast. Bulletin of the British Ornithologists' Club* 120: 198–200.

Pinto, O. M. O. (1978). *Novo catálogo das aves do Brasil, primeira parte: aves não Passeriformes e Passeriformes não Oscines com exclusão da família Tyrannidae.* Empresa Gráfica Revista dos Tribunais, São Paulo.

Prellvitz, L. J., Hogan, R. I. & Vooren, C. M. (2009) *Breeding biology of Kelp Gulls (Larus dominicanus) on Desert Island, Southern Brazil.* Ornitología Neotropical 20: 61–72.

Quintana, F. & Yorio, P. (1998) *Competition for nest sites between Kelp Gulls (Larus dominicanus) and Terns (Sterna maxima and S. eurygnatha) in Patagonia.* Auk 115: 1068-1071.

Rodrigues, A. A. F. (2007). *Priority areas for conservation of migratory and resident waterbirds on the coast of Brazilian Amazonian.* Revista Brasileira de Ornitologia 15: 209-218.

Sangster, J. (2000). *Taxonomic stability and avian extinctions.* Conservation Biology 14: 579–581.

Schulz-Neto, A. (2004a). *Aves insulares do Arquipélago de Fernando de Noronha.* Pp. 147-168 *in*: Branco, J.O. (org.) Aves marinhas e insulares brasileiras: bioecologia e conservação. Itajaí: Editora da Univali.

Schulz-Neto, A. (2004b). Aves marinhas do Atol das Rocas. Pp. 169-192 *in*: Branco, J.O. (org.) *Aves marinhas e insulares brasileiras: bioecologia e conservação.* Itajaí: Editora da Univali.

Sick, H. (1997). *Ornitologia brasileira. Rio de Janeiro:* Editora Nova Fronteira.

Silva e Silva, R. & Olmos, F. (in press). *Notes on the biology and morphology of Audubon's Shearwaters Puffinus lherminieri from Fernando de Noronha, north-eastern Brazil.* Revista Brasileira de Ornitologia 17.

Silveira, I. C. A., Miranda, & Brown, W. S (1994). *On the origins of the North Brazil Current.*

Journal of Geophysical Research 99: 22501–22512.

Silveira, I. C. A., Schimidt, A. C. K., Campos, E. J. D., Godoi, S. S. & Ikeda, Y. (2000). *A Corrente do Brasil ao largo da costa brasileira*. Revista Brasileia de Oceanografia 48: 171–183.

Souza, J. M. (1999). *Mar territorial, zona econômica exclusiva ou plataforma continental?* Revista Brasileira de Geofísica 17: 79-82.

Villwock, J. A. (1994). *A costa brasileira: geologia e evolução. Notas Técnicas* (7). Porto Alegre.

Vooren, C. M. & Brusque, L. F. (1999). As aves do ambiente costeiro do Brasil: biodiversidade e conservação. Fundação Universidade Federal do Rio Grande, Rio Grande.

Vooren, C. M. & Chiaradia, A. (1990). *Seasonal abundance and behaviour of coastal birds on Cassino beach, Brazil*. Ornitología Neotropical 1: 9-24.

Warham, J. (1990). *The petrels: their ecology and breeding systems*. Academic Press, London.

Yorio, P. & Efe, M. A. (2009). *Population status of Royal and Cayenne Terns breeding in Argentina and Brazil*. Waterbirds 31: 561-570.

Yorio, P., Quintana, F., Campagna, C. & Harris, G. (1994). *Diversidad, abundancia y dinamica espacio-temporal de la colonia mixta de aves marinas en Punta Leon, Patagonia*. Ornitología Neotropical 6: 69–77.

Yorio, P., Bertellotti, M., Gandini, P. & Frere, E. (1998) *Kelp Gulls (Larus dominicanus) breeding on the Argentine coast: population status and a review of its relationship with coastal management and conservation*. Marine Ornithology 26: 11-18.

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Buller's Albatross *Diomedea bulleri*. 38.4S 140.6E off Port MacDonnell, S. Australia. 31.5.09. *Photo:* Neil Cheshire.

Wandering Albatross (immature) 38.4S 140.6E off Port MacDonnell, S. Australia, 31.5.09. *Photo:* Neil Cheshire.

Black-browed Albatross (NZ sub-species impavida) *Diomedea melanophris impavida*. 38.4S 140.6E off Port MacDonnell, S. Australia. 31.5.09. *Photo:* Neil Cheshire.

Left: Shy Albatross *Diomedea cauta* Right: Salvin's Albatross *Diomedea salvini* (right) 38.4S 140.6E off Port MacDonnell, S. Australia, 31.5.09. *Photo:* Neil Cheshire.

Appendix 1. Check-list of seabirds species confirmed in Brazil. Taxonomy and species sequence follow the Brazilian Committee of Ornithological Records (2008). Status refers to whether species breed in the country or elsewhere: Breeding in the country (B); Migrant from the Southern South America, sub-Antarctic islands and the Antarctic continent (MS); Migrant from the North hemisphere (MN); and Vagrant (V) species with apparently irregular occurrence in Brazil. Museum collections housing voucher specimens documenting the occurrence of the various species are: MPEG - Museu Paraense Emílio Goledi (Belém), UFPE - Universidade Federal de Pernambuco (Recife), MCNC - Museu de Ciências Naturais da CETREL (Camaçari), MNRJ - Museu Nacional/Universidade Federal do Rio de Janeiro (Rio de Janeiro), MZUSP - Museu de Zoologia da Universidade de São Paulo (São Paulo), UFSC - Universidade Federal de Santa Catarina (Florianópolis); MOVI - Museu Oceanográfico da Univerisade do Vale do Itajaí, MCN-FZB - Museu de Ciências Naturais da Fundação Zoobotânica do Rio Grande do Sul (Porto Alegre), UNISINOS - Universidade do Vale do Rio dos Sinos (São Leopoldo), UFPel - Universidade Federal de Pelotas (Pelotas), FURG - Fundação Universidade Federal do Rio Grande (FURG), BMNH - Natural History Museum (Tring), USNM - United States National Museum, Smithsonian Institution (Washington, DC).

Order SPHENISCIFORMES
Family SPHENISCIDAE (4 spp.)
King Penguin *Aptenodytes patagonicus* (VA); MNRJ
Magellanic Penguin *Spheniscus magellanicus* (MS); UFPE, MCNC, MNRJ, MZUSP, MOVI, FURG
Macaroni Penguin *Eudyptes chrysolophus* (VA); MZUSP
Rockhopper Penguin *Eudyptes chrysocome* (VA); MCN-FZB, UFPel, FURG

Order PROCELLARIIFORMES
Family DIOMEDEIDAE (10 spp.)
Sooty Albatross *Phoebetria fusca* (VA); MCNC, MZUSP, MOVI, FURG
Light-mantled Albatross *Phoebetria palpebrata* (VA); MCNC, MZUSP
Atlantic Yellow-nosed Albatross *Thalassarche chlororhynchos* (MS); UFPE, MCNC, MNRJ, MZUSP, MOVI, FURG
Black-browed Albatross *Thalassarche melanophris* (MS); MCNC, MNRJ, MZUSP, MOVI, FURG
Grey-headed Albatross *Thalassarche chrysostoma* (VA); MNRJ, MZUSP
Shy Albatross *Thalassarche cauta* (VA); MCNC, MNRJ, MOVI
Southern Royal Albatross *Diomedea epomophora* (MS); MNRJ, MZUSP, UNISINOS, FURG
Northern Royal Albatross *Diomedea sanfordi* (VA); FURG
Wandering Albatross *Diomedea exulans* (MS); MOVI
Tristan Albatross *Diomedea dabbenena* (MS); MZUSP, MOVI, FURG

Family PROCELLARIIDAE (25 spp.)
Southern Giant-Petrel *Macronectes giganteus* (MS); MNRJ, MZUSP, MOVI, FURG
Northern Giant-Petrel *Macronectes halli* (MS); MZUSP, FURG
Southern Fulmar *Fulmarus glacialoides* (MS); UFPE, MCNC, MNRJ, MZUSP, MOVI, FURG
Cape Petrel *Daption capense* (MS); MCNC, MNRJ, MZUSP, MOVI, FURG
Kerguelen Petrel *Lugensa brevirostris* (VA); MCNC, MNRJ, FURG
Soft-plumaged Petrel *Pterodroma mollis* (MS); MCNC, MZUSP, MOVI, FURG
Atlantic Petrel *Pterodorma incerta* (MS); MCNC, MNRJ, MZUSP, MOVI, FURG
White-headed Petrel *Pterodroma lessonii* (VA); UFSC
Kermadec Petrel *Pterodroma neglecta* (B); USNM
Great-winged Petrel *Pterodroma macroptera* (VA); FURG

Trindade Petrel *Pterodroma arminjoniana* (B); MNRJ
Blue Petrel *Halobaena caerulea* (MS); MNRJ, UNISINOS
Broad-billed Prion *Pachyptila vittata* (VA); FURG
Antarctic Prion *Pachyptila desolata* (MS); MPEG, UFPE, MCNC, MNRJ, MZUSP, FURG
Slender-billed Prion *Pachyptila belcheri* (MS); MCNC, MNRJ, MZUSP, FURG
Grey Petrel *Procellaria cinerea* (VA); MCNC, FURG
White-chinned Petrel *Procellaria aequinoctialis* (MS); MCNC, MNRJ, MZUSP, MOVI, FURG
Spectacled Petrel *Procellaria conspicillata* (MS); MZUSP, MOVI, FURG
Cory's Shearwater *Calonectris borealis* (MN); UFPE, MCNC, MNRJ, MZUSP, MOVI, FURG
Cape Verde Shearwater *Calonectris edwardsii* (MN); UFPE, MZUSP, UNISINOS
Sooty Shearwater *Puffinus griseus* (MS); MCNC, MNRJ, MZUSP, FURG
Short-tailed Shearwater *Puffinus tenuirostris* (VA); single Brazilian specimen deposited in a private collection
Greater Shearwater *Puffinus gravis* (MS); UFPE, MCNC, MNRJ, MZUSP, MOVI, FURG
Manx Shearwater *Puffinus puffinus* (MN); UFPE, MCNC, MNRJ, MZUSP, MOVI, FURG
Audubon's Shearwater *Puffinus lherminieri* (B); MNRJ, MZUSP

Family HYDROBATIDAE (5 spp.)
White-bellied Storm-Petrel *Fregetta grallaria* (MS); Published photographs
Black-bellied Storm-Petrel *Fregetta tropica* (VA); MCNC, BMNH
Wilson's Storm-Petrel *Oceanites oceanicus* (MS); MCNC, MNRJ, MZUSP, FURG
White-faced Storm-Petrel *Pelagodroma marina* (VA); MCNC
Leach's Storm-Petrel *Oceanodroma leucorhoa* (MN); MPEG, MCNC, MNRJ, MZUSP

Family PELECANOIDIDAE (1 sp.)
Magellanic Diving-Petrel *Pelecanoides meagellani* (VA); FURG

Order PELECANIFORMES
Family PHAETHONTIDAE (3spp.)
Red-billed Tropicbird *Phaethon aethereus* (B); MNRJ, MZUSP
Red-tailed Tropicbird *Phaethon rubricauda* (VA); Published photographs
White-tailed Tropicbird *Phaethon lepturus* (B); MNRJ, MZUSP

Family PELECANIDAE (1 sp.)
Brown Pelican *Pelecanus occidentalis* (VA); MPEG

Family SULIDAE (5 spp.)
Cape Gannet *Morus capensis* (VA); Published photographs
Australian Gannet *Morus serrator* (VA); MNRJ
Masked Booby *Sula dactylatra* (B); UFPE, MCNC, MNRJ, MZUSP
Red-footed Booby *Sula sula* (B); MNRJ
Brown Booby *Sula leucogaster* (B); UFPE, MCNC, MNRJ, MZUSP

Family FREGATIDAE (3 spp.)
Magnificent Frigatebird *Fregata magnificens* (B); UFPE, MNRJ, MZUSP, MOVI, FURG
Great Frigatebird *Fregata minor* (B); MNRJ
Lesser Frigatebird *Fregata ariel* (B); MNRJ

Family CHIONIDAE (1 sp.)
Snowy Sheathbill *Chionis albus* (VA); FURG

Family STERCORARIIDAE (7 spp.)
Great Skua *Stercorarius skua* (MN); MPEG

Franklin's Gull *Larus pipixcan*, Arica, Chile, 24 November 2004.
Photo: Neil Cheshire.

Chilean Skua *Stercorarius chilensis* (MS); MCNC, MNRJ, FURG, BMNH
South Polar Skua *Stercorarius maccormicki* (MS); UFPE, MCNC, MNRJ
Southern Skua *Stercorarius antarcticus* (MS); MCNC, MCN-FZB, FURG
Pomarine Jaeger *Stercorarius pomarinus* (MN); MCNC, MZUSP, UNISINOS
Parasitic Jaeger *Stercorarius parasiticus* (MN); MCNC, MZUSP, FURG
Long-tailed Jaeger *Stercorarius longicaudus* (MN); MCNC, MZUSP, FURG

Family LARIDAE (8 spp.)
Brown-hooded Gull *Chroicocephalus maculipennis* (B); MOVI, FURG
Grey-headed Gull *Chroicocephalus cirrocephalus* (B); Published photographs
Laughing Gull *Leucophaeus atricilla* (B/MN); Published photographs
Franklin's Gull *Leucophaeus pipixcan* (VA); Published photographs
Olrog's Gull *Larus atlanticus* (MS); Published photographs
Ring-billed Gull *Larus delawarensis* (VA); Published photographs
Kelp Gull *Larus dominicanus* (B/MS); MNRJ, MZUSP, MOVI, FURG
Lesser Black-backed Gull Larus fuscus (VA); Published photographs

Family STERNIDAE (17 spp.)
Brown Noddy *Anous stolidus* (B); MCNC, MNRJ, MZUSP, MCN-FZB, FURG
Black Noddy *Anous minutus* (B); MPEG, MNRJ, MZUSP
White Tern *Gygis alba* (B); MNRJ, MZUSP
Sooty Tern *Onychoprion fuscatus* (B); MNRJ, MCNC, MZUSP
Least Tern *Sternula antillarum* (B/MN); Published photographs
Yellow-billed Tern *Sternula superciliaris* (B); MPEG, MZUSP, FURG
Large-billed Tern *Phaetusa simplex* (B); MPEG, MNRJ, MZUSP
Gull-billed Tern *Gelochelidon nilotica* (B); MZUSP
Black Tern *Chlidonias niger* (VA); Published photographs
Common Tern *Sterna hirundo* (MN); MPEG, UFPE, MCNC, MZUSP, MOVI, FURG
Roseate Tern *Sterna dougallii* (MN); UFPE, MCNC, MZUSP
Arctic Tern *Sterna paradisaea* (MN); MCNC, MNRJ
South American Tern *Sterna hirundinacea* (B/MS); MZUSP, FURG
Antarctic Tern *Sterna vittata* (VA); MNRJ
Trudeau's Tern *Sterna trudeaui* (B); FURG
Sandwich Tern *Thalasseus sandvicensis* (B/MS); MCNC, MNRJ, MZUSP, FURG
Royal Tern *Thalasseus maximus* (B/MS); FURG

Family RHYNCOPIDAE (1 sp.)
Black Skimmer *Rhyncops niger* (B); UFPE, MZUSP, FURG

THREATENED TERNS IN NORTH-EAST BRAZIL

Every year, many Nearctic terns leave their breeding grounds to winter throughout Central and South America, returning to North America in the next north-hemisphere spring. Common *Sterna hirundo* and Roseate Terns *S. dougallii* are the most numerous migratory terns found in South America, but little have been published about the ecology of these birds in their wintering grounds.

In Brazil, large flocks of Common Terns have been recorded in Lagoa do Peixe National Park in the extreme south of the country (e.g. Harington *et al.* 1986). This species also congregates along other parts of the Brazilian coast, generally near food-rich wetland areas. Until recently, the wintering grounds of North-American Roseate Terns were virtually unknown. However, efforts of researchers of the Great Gull Island Project of the American Museum of Natural History, New York, together with Brazilian ornithologists (e.g. Hays *et al.* 1997, 1999, Lima *et al.* 2006), identified Mangue Seco in the State of Bahia as an important site for this species. Common Terns also concentrate abundantly at this point.

On the coast of NE Brazil, between the States of Ceará-Bahia, both Common and Roseate Terns were found to be common (Figures 1, 2), though few studies (e.g. Fedrizzi 2003) have attempted to quantify their seasonal abundance. Ornithologists of the 'Associação de Pesquisa e Preservação de Ecossistemas Aquáticos' (AQUASIS; Box 1) carried out preliminary tern surveys along the coast of Ceará in 2005-2006. Besides the above-mentioned species, other taxa were noted: Least *Sternulla antillarum*, Yellow-billed *Sternula superciliaris*, Large-billed *Phaetusa simplex*, Gull-billed *Gelochelidon nilotica*, and Cayenne Terns *Thalasseus (sandvicensis) eurygnathus*. It is also noteworthy to mention that AQUASIS team was able to record the Lesser Black-backed Gull *Larus fuscus* for the first time in Brazil (Girão *et al.* 2006).

During the field-work, the village of Quixaba - located *c.*150 km east of Fortaleza, capital city of Ceará - was identified as a critical site for tern conservation in the state. In this place, there is a small fleet of coastal shrimp trawlers operating, and terns and other seabirds usually follow the boats for the fisheries by-catch, i.e., unwanted or non-target part of the catch taken by fishermen. Terns are easily caught by hand when they land on boats and frequently killed for their metal rings. AQUASIS team and ornithologist Pedro Lima of CETREL (a Brazilian environmental consulting firm) discovered large numbers of rings from Common and Roseate Terns, often being used as jewellery.

Box 1. 'Associação de Pesquisa e Preservação de Ecossistemas Aquáticos' (AQUAIS) activities in the state of Ceará, north-east Brazil

AQUASIS (www.aquasis.org - website in Portuguese) is a non-profit NGO created in 1994 that conducts conservation processes (not only projects) to deal with some of the most pressing environmental issues in the State of Ceará and neighboring areas. Our focus is on endangered species and their habitats, and we have been working with four Critically Endangered taxa in our region (the birds Araripe Manakin *Antilophia bokermanni* and Grey-breasted Parakeet *Pyrrhura griseipectus*; the Caatinga Red-handed Howling Monkey *Alouatta ululata*; and the Southern Antillean Manatee *Trichechus manatus manatus*).

After conducting preliminary surveys in the past two years with migratory shorebirds, terns and other seabirds, we have enhanced our understanding about the importance of NE Brazil coastline for these birds. In this sense, we expect to implement a long-term process to gather more information and use it to protect critical habitats for coastal and seabirds.

Roseate Tern has a large global population estimated to be 78,000-82,000 individuals. Globally, this species is evaluated as 'Least Concern' (BirdLife International 2007). The population in North America underwent a significant decline in 40 years, decreasing from 8,500 pairs in the early 1930s to 2,500 in 1978. The Canadian Wildlife Service lists Roseate Tern as 'Threatened'. The U.S. Department of Interior lists the north-east USA breeding population as 'Endangered' and the Caribbean population as 'Threatened'. Birds from USA and the Caribbean have been recovered in NE Brazil (Hays *et al.* 1997, Lima *et al.* 2004).

In 2006-2007, the Great Gull Island Project (American Museum of Natural History/New York) supported an educational programme run by AQUASIS ('Projeto gaivotas - Uma Aliança com o Ceará') to reduce the trapping of terns in Quixaba. This consisted of educational campaigns with fishermen, in the local school, and discussions with people seen to be wearing necklaces and bracelets made of tern rings. Talks and slide-shows with a conservation theme were attended by most members of the community. Publicity material, such as t-shirts bearing tern conservation messages were also produced. Apparently, terns are not being killed for their rings anymore.

To celebrate this highly successful project, AQUASIS promoted two regattas of miniature models of the traditional rugged sailing boats locally known as 'jangadas'. This unique vessel represents the fusion of a raft by Indians of NE Brazil with technologies such as a sail, centre-board and bench seat which were first introduced by Portuguese colonists. The construction of the 'mini-jangadas' is a local tradition and has long served as a sailing school for children over generations. Besides a very colourful and competitive contest, the regattas were a festive celebration of environmental activism and local traditions (Figure 3).

In Ceará, coastal shrimp trawl fisheries are concentrated in the municipality of Fortaleza. For example, in 1999 boats from this region landed 1,039 tons of shrimp, 93% of the state's production (Campos *et al.* 2003). In this context, it would be important to monitor this fishery in order to detect anthropogenic impacts on migratory terns. It must be noted that our understanding of the biology and sources of migratory tern mortality on wintering areas remains poor. Study of these topics is particularly important for elucidating population dynamics, and formulating conservation and management plans.

Acknowledgments

All this work would have not be possible without generous support from the Great Gull Island Project/American Museum of Natural History, New York (Dr. Helen Hays), which provided all the funds required for the project's work. AQUASIS is also supported by Serviço Social do Comercio (Sesc/Fecomercio).

References:

BirdLife International 2007. Species factsheet: *Sterna dougallii*. Available at: http://www.birdlife.org (Accessed on December, 11th 2007).

Campos, A. A., Monteiro, A.Q., Monteiro-Neto, C. & Polette, M. (Coords.) 2003. *A zona costeira do Ceará: diagnóstico para a gestão integrada*. AQUASIS, Fortaleza.

Fedrizzi, C. E. 2003. *Abundância sazonal e biologia de aves costeiras na Coroa do Avião, Pernambuco, Brasil*. M.Sc. Thesis. Universidade Federal de Pernambuco, Recife.

Girão, W., Albano, C., Pinto, T., Campos, A., Meirelles, A. C. & Silva, C. P. N. 2006. *First record of the Lesser Black-backed Gull Larus fuscus Linnaeus, 1758 for Brazil*. Rev. Brasil. Ornitol. 14: 463-464.

Hays, H., DiCostanzo, J., Cormons, G., Antas, P. T. Z., Nascimento, J. L. X., Nascimento, I. L. S. & Bremer, R. E. 1997. *Recoveries of Roseate and Common Terns in South America*. J. Field Ornithol. 68: 79-90.

Hays, H., Lima, P., Monteiro, L., DiCostanzo, J., Cormons, G., Nisbet, I. C. T., Saliva, J. E., Spendelow, J. A., Burger, J., Pierce, J. & Gochfeld, M. 1999. *A nonbreeding concentration of Roseate and Common Terns in Bahia Brazil*. J. Field Ornithol. 70: 455-464.

Harrington, B. A., Antas, P. T. Z. & Silva F. 1988. *Observation of Common Terns in Southern Brazil*. J. Field Ornithol. 57: 222–224.

Lima, P. C., Hays, H., Lima, R. C. F. R., Cormons, T., Cormons, G., DiCostanzo, J. & Santos, S. S. 2004. *Recuperações de Sterna dougallii (Montagu, 1813) na Bahia, Brasil, entre 1995 e 2004*. *Ararajuba* 12: 147-149.

Caio J. Carlos, Alberto A. Campos, Weber Girão & Ciro Albano
AQUASIS - Associação de Pesquisa e Preservação de Ecossistemas Aquáticos, Praia de Iparana S/N (SESC Iparana), CEP: 61600-000, Caucaia, CE, Brazil.

Figure 1. Ringed Common Tern *Sterna hirundo*, Grossos in the State of Rio Grande do Norte, north-east Brazil, 22 October 2005. *Photo:* Ciro Albano.

Figure 2. Threatened Roseate Tern *Sterna dougallii*. Peçém in the State of Ceará, north-east Brazil, 25 September 2007. *Photo:* Ciro Albano.

Figure 3. Race of 'mini-jangadas', Quixaba in the State of Ceará, north-east Brazil, November 2007. *Photo:* Vinícius Lima.

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OBITUARY

Ken Partridge

It was with great regret that we learn that Ken Partidge passed away in June. Ken had always had a great interest in Birds, particularly Seabirds and in 1990 he formed the South West Oiled Seabird Group (SWOSG) and with volunteer help, treated and rehabilitated a large number of Seabirds which could then be released. He wrote a number of papers and was a co author of the 1991 book 'The Status of Seabirds in Britain and Ireland'. Having served in the RN until 1964 he was a member of a number of Naval Associations, including the Saltash Branch of the RNA. He was also a keen sailor. A caring, gentle man he is a sad loss to the Birdwatching community.

Sea Swallow 58 (2009)

BIRDS ON TWO WINTER VOYAGES BETWEEN CAPE TOWN, GOUGH ISLAND AND TRISTAN DA CUNHA, IN JUNE-JULY OF 1974 AND 1975.

by Beau W. Rowlands

This account takes in my first and second visits (of five) to Tristan da Cunha (37.1S 12.3W) and first (of two) at Gough Island (40.4S 09.9W) - see also Rowlands (1994, 2006). There is a notable paucity of seabird records on this route for the months of June and July (mid-winter), due to a paucity of shipping opportunities. Observations are from two supply voyages of the MV *RSA*, a research ship of the South African Department of Transport.

Built in Japan, the *RSA* was delivered to Cape Town in 1961 as an annual relief vessel for the South African weather stations at Gough Island, Marion Island and Queen Maud Land, Antarctica. At Tristan the *RSA* regularly discharged cargo around October, during the official Gough relief voyage, and around April, on a charter arranged by Thomas Cook (Freight Department) in Cape Town for the Government of Tristan da Cunha. The vessel's first call at Tristan (bound Gough) was in 1963 (15 April), with mail for the first Islanders newly repatriated following the October 1961 eruption and evacuation to the UK. Her final visits to both Gough and Tristan were in October 1977, her successor from 1978 being the current *SA Agulhas*. The ship's speed was between 3.7 and 11.45 knots. All times are GMT, which at Gough and Tristan is also local time.

The 1974 voyage

On Tristan my hosts were Dr Michael E. 'Mike' Richardson, medical practitioner and ornithologist, and his teacher wife Loretto - see Richardson (1984). The *RSA* sailed from Cape Town on 7 June 1974 (1530 hrs), was at Gough from 16 June (0612 hrs) to 19 June (1800 hrs), was at Tristan from 20 June (2212 hrs) to 29 June (1536 hrs), and was back at Cape Town on 6 July (1340 hrs).

At Tristan I had 7 days ashore, from 22 June, with landing delayed by a hurricane (over Force 12) on 21 June when snow settled well below the Base plateau (600 m) above the Settlement. Included was a hike to Anchorstock Point in the west, on 24 June.

Gough was a diversion from the charter to deliver an urgent hydrogen generator, and I was allowed ashore briefly (19 June). With rough seas at the weather station (Transvaal Bay) on arrival the *RSA* had to circle, anchoring overnight in the lee at Lot's Wife Cove (16 June), Hawkins Bay (17 June) and Quest Bay (18 June), when crewmen with handlines caught Bluefish or Barrelfish *Hyperoglyphe perciforma*, Fivefingers *Acantholatris monodactylus* and False Jacopever *Sebastes capensis* (Cooper & Ryan 1994: 92), the last a bottom-feeder used as bait. On 19 June, at dusk, as we sailed for Tristan, thousands of seabirds, of mixed species and many not possible to identify, gathered off shore, on and above the surface - in a rising gale when, indeed, the weather station reported an 'invasion' of mice!

The outward leg (Cape Town-Gough) was 1505 nm (av 7.32 knots), the Gough-Tristan leg 238 nm (av. 8.44 knots) and the return (Tristan-Cape Town) 1533 nm (av. 9.23 knots). Noon positions at sea and cumulative n-miles steamed are as follows. *Outward leg*: 8 June 33.8°S 15.9°E (123 nm); 9 June 33.7°S 11.8°E (328 nm); 10 June 33.9°S 8.3°E (503 nm); 11 June 33.9°S 6.2°E (612 nm); 12 June 35.0°S 3.4°E (763 nm), 13 June 35.6°S 0.5°W (958 nm); 14 June 36.3°S 4.3°W (1145 nm); 15 June 38.3°S 7.4°W (1338 nm); 16 June Gough (1505 nm). *Gough-Tristan*: 20 June 38.3°S 11.7°W (150 nm); 21 June Tristan (238 nm). *Return leg*: 30 June 36.4°S 9.9°W (121 nm); 1 July 36.1°S 6.6°W (287 nm); 2 July 35.9°S 2.1°W (511 nm); 3 July 35.4°S 2.6°E (739 nm); 4 July 34.9°S 7.8°E (996 nm); 5 July 34.5°S 12.9°E (1249 nm); 6 July 34.2°S 17.9°E (1502 nm, 31 into Cape Town). Sea temperatures were at Cape Town 13.0°C, Gough 12.5°C and Tristan 14.2°C.

The 1975 voyage

See also Rowlands (1976). On Tristan my hosts were Islanders Peter and Pat Repetto. Peter was in charge of the Island Store. The *RSA* sailed from Cape Town on 13 June 1975 (1358 hrs), was at Tristan from 23 June (1500 hrs) to 27 June (1736 hrs, ashore full period), and was back at Cape Town on 3 July (2055 hrs). The outward leg was 1548 nm (av 6.40 knots), the return 1534 nm (av 10.42 knots). Due to exceptionally high seas, the shortest ship's run in 24 hours, 20-21 June, was just 76 nm (av 3.17 knots), but on arrival Tristan all were rewarded with magnificent views of Queen Mary's Peak (2060 m), heavily snow-capped, against a brilliant blue sky.

Noon positions at sea and cumulative n-miles steamed are as follows. *Outward leg*: 14 June 33.9°S 14.2°E (212 nm); 15 June 33.8°S 11.2°E (363 nm); 16 June 33.9°S 8.0°E (519 nm); 17 June 33.9°S 4.9°E (675 nm); 18 June 34.0°S 0.4°E (900 nm); 19 June 34.7°S 2.8°W (1063 nm); 20 June 35.4°S 4.7°W (1167 nm); 21 June 35.7°S 6.2°W (1243 nm); 22 June 36.3°S 8.5°W (1358 nm); 23 June 36.9°S 11.8°W (1522 nm, 26 into Tristan anchorage). *Return leg*: 28 June 36.2°S 8.3°W (202 nm); 29 June 35.3°S 2.8°W (476 nm); 30 June 34.9°S 2.5°E (735 nm); 1 July 34.5°S 7.4°E (980 nm); 2 July 34.2°S 11.3°E (1175 nm); 3 July 33.5°S 16.2°E (1421 nm, 113 into Cape Town).

Species Accounts

A total of 26 species were identified, plus an unidentified gadfly-petrel and shearwaters. Accounts are sub-headed - for the *outward leg* (Cape Town-Gough/Tristan), *at islands* (incl. 1974 Gough-Tristan leg), and for the *return leg* (Tristan-Cape Town). Observations, mainly from the stern and bridge, did not follow set times, and no account was taken of repeat sightings. Unlike subsequent voyages (Rowlands 1994, 2006), this was before the ten-minute card method of counts was described by Tasker *et al.* (1984); hence my inclusion of noon positions and distances in the voyage details above.

Jackass/African Penguin ***Spheniscus demersus***. A few (under 10) were present off the breakwater, Cape Town Docks, 6 Jul 1974, 13 Jun 1975.

Wandering/Tristan Albatross ***Diomedea exulans/dabbenena***. On both voyages present nearly every day, with counts of up to 10 birds. Of the seven plumage stages (Harrison 1983:

47, 222), sightings in 1974 were nil for Stage 1 (juvenile) and Stage 2 (immature), 7% for Stage 3, 41% Stage 4, 7% Stage 5, 27% Stage 6 and 18% for Stage 7 (older birds, incl. 'snowy' males), while in 1975 resp. they were 2%, 9%, 17%, 29%, 15%, 23% and 5%. *Outward leg*: In 1974 present 8, 9, 10, 11, 12 and 15 Jun; in 1975 on 14, 15, 16, 18, 19 and 21 Jun, with counts of 6 and 9 birds on the surface, astern, on 15 and 21 Jun resp. *At islands*: At Gough, off Tristania Rock (NW side), three singles (Stage 6) in transit between skyline and sea, 16 Jun 1974. Present at sea between Gough and Tristan, 20 Jun 1974; at Tristan anchorage and departure (Stage 6, up to 10 in flight and on surface right alongside vessel), 29 Jun 1974 and 27 Jun 1975 (sunset), scavenging discarded bait from crew fishing. *Return leg*: In 1974 present 30 Jun, and 1, 2, 3, 4, 5 (Stage 7) and 6 Jul; in 1975 present 28, 29 Jun, 2, 3 Jul.

Black-browed Albatross ***Thalassarche melanophris***. *Outward leg*: In 1974, singles (adult and sub-adult) 8 Jun, and up to 4 sub-adults and 3 juveniles scavenging together (with one adult) on surface astern, 15 Jun; in 1975 present 14, 16, 19 and 21 Jun, all sub-adults. *At islands*: Tristan anchorage and departure, up to 15 in flight and on surface, all sub-adults, 29 Jun 1974, 27 Jun 1975. *Return leg*: In 1974 present 30 Jun and 4 and 5 Jul (all sub-adults), and 6 Jul (single, immature); in 1975 (single, sub-adult) 29 Jun.

Black-browed Albatross (Immature) *Diomedea melanophris* 8.4S 140.6E off Port MacDonnell, S. Australia, 31.5.09. *Photo:* Neil Cheshire.

Sooty Albatross ***Phoebetria fusca.*** Sightings two days from Cape Town. *Outward leg*: Single, 15 Jun 1975. *Return leg*: Two together, passing over wake astern, 4 Jul 1974.

Light-mantled Sooty Albatross ***Phoebetria palpebrata***. Single bird, in flight over very rough seas, not attracted to vessel, 19 Jun 1975.

Southern Giant Petrel ***Macronectes giganteus***. *Outward leg*: Two together, astern, 13, 14 Jun 1974. *At islands*: Gough Island, 1974, two singles (one juvenile, one white morph), in flight off The Admiral and N along E coast, 16 Jun, juvenile in flight off Tristania Rock and 8 juveniles and 2 adults together on surface at anchorage, Lot's Wife Cove, 17 Jun, 8 juveniles and 5 adult birds on surface during brief anchorage, The Glen, 18 Jun. Around the ship scavenged discarded bait from crew fishing. *Return leg*: In 1975, singles (adults), in flight astern, 29 Jun, 2 Jul.

Northern Giant Petrel ***Macronectes halli***. *Return leg*: Single bird, in flight, 29 Jun 1975.

Cape or Pintado Petrel ***Daption capense***. The most numerous species. Sightings in singles and flocks astern up to 25 birds. *Outward leg*: In 1974, present 12 Jun, in 1975, present 15, 18, 19, 21 Jun. *At islands*: Between Gough and Tristan, 20 Jun 1974; Tristan anchorage, on departure, 29 Jun 1974, 27 Jun 1975. *Return leg*: In 1974, present 30 Jun, 1, 2, 3, 4, 5 Jul; in 1975, present 28, 29 Jun, 2 Jul.

Gadfly-petrel sp ***Pterodroma sp.*** A single bird, pot-bellied in appearance, passed over the ship, 15 Jun 1974.

Great-winged Petrel ***Pterodroma macroptera***. On Tristan, just below the Base plateau near Anchorstock Point, nest in burrow, steep slope (silvery fern ground-cover), adult incubating (egg fresh), 24 Jun 1974.

Atlantic Petrel ***Pterodroma incerta***. *Outward leg*: Single, 12 Jun 1974. *At islands*: Gough Island, 1974, birds on deck overnight, at anchorages Lot's Wife Cove, 16-17 Jun, Hawkins Bay 17-18 Jun and Quest Bay, 18-19 Jun. Seen at dusk in mixed flocks off shore, Transvaal Bay, 19 Jun.

Soft-plumaged Petrel ***Pterodroma mollis***. *Outward leg*: One on 15 Jun, 1974, in rapid flight across bows, ignoring the ship. *At islands*: Gough Island, 1974, birds on deck overnight, anchorages Lot's Wife Cove, 16-17 Jun, Hawkins Bay 17-18 Jun and Quest Bay, 18-19 Jun; dark morph bird found in radio cabin by Chief Engineer, examined and released in early morning, Hawkins Bay, 18 Jun. Seen at dusk in mixed flocks off shore, Transvaal Bay, 19 Jun.

Broad-billed Prion ***Pachyptila vittata***. Numerous at Gough Island, 1974, many on deck overnight, anchorages Lot's Wife Cove, 16-17 Jun, Hawkins Bay, 17-18 Jun, and Quest Bay, 18-19 Jun, also entering crew's quarters and cabins through portholes. Prions seen at dusk in mixed flocks off shore, Transvaal Bay, 19 Jun.

Shearwaters sp ***Puffinus* sp.** *Outward leg*: Two singles, 13 Jun 1974. *Return leg*: Three birds together, 2 Jul 1975. None were attracted to the vessel.

White-chinned Petrel ***Procellaria aequinoctialis***. Sightings in singles and groups around ship but mainly astern, up to 20 birds at a time. *Outward leg*: In 1974, present 15 Jun, in 1975, present 14, 15 and 21 Jun. *At islands*: At Gough, 1974, three off SE coast and two off Tristania Rock, 16 Jun, at Transvaal Bay anchorage, 19 Jun, and at sea between Gough

and Tristan, 20 Jun. *Return leg*: In 1974, present 30 Jun, 1, 2, 3, 4, 5 and 6 Jul; in 1975, present 28 Jun, 3 Jul.

Spectacled Petrel ***Procellaria conspicillata***. Single bird, close astern, 19 Jun 1975.

Grey Petrel ***Procellaria cinerea***. On Tristan, just below the Base plateau, near Anchorstock Point, nest found by M.E. Richardson in fern-bush cover on steep slope, chick, 24 Jun 1974.

Grey-backed Storm-petrel ***Garrodia nereis***. Gough Island, 1974, a few on deck overnight, anchorages Lot's Wife Cove, 16-17 Jun, Hawkins Bay, 17-18 Jun, and Quest Bay, 18-19 Jun.

Wilson's Storm-petrel ***Oceanites oceanicus***. *Outward leg*: Four astern, 14 Jun 1974. *At islands*: Birds at Tristan anchorage, on departure, 29 Jun 1974.

Common Diving-petrel ***Pelecanoides urinatrix***. Gough Island, 1974, many on deck overnight, anchorages Lot's Wife Cove, 16-17 Jun, Hawkins Bay, 17-18 Jun, and Quest Bay, 18-19 Jun. Seen at dusk in mixed flocks off shore, Transvaal Bay, 19 Jun.

Cape Cormorant ***Phalacrocorax capensis***. Present off Cape Town, 6 Jul 1974, 13 Jun 1975.

Snowy Egret ***Egretta thula***. Tristan Settlement, two birds together, west of harbour, 23 and 27 Jun 1974.

American Purple Gallinule ***Porphyrula martinica***. Tristan Settlement, single immature in 'Auntie Martha's [Rogers] Tussock Garden', 25 Jun 1974.

Southern Skua ***Catharacta antarctica***. *Outward leg*: One astern, 8 Jun 1974. *At islands*: At Gough, one around ship in Quest Bay, with Southern Giant Petrels scavenging discarded bait from crew fishing, 18 Jun 1974. At Tristan counts of up to 3 birds, at anchorage and departure, 29 Jun 1974, 27 Jun 1975. *Return leg*: Singles around ship (Brown Skua *C. a. lonnbergi*), 6 Jul 1974, 2 Jul 1975.

Kelp Gull ***Larus dominicanus***. Singles, and groups of up to five, adults and immatures, around ship in and off Cape Town Docks, 6 Jul 1974, 13 Jun 1975. At Gough Island single immature, in flight off The Admiral and N along E coast, 16 Jun 1974.

Hartlaub's Gull ***Larus hartlaubii***. Singles seen from the ship in and off Cape Town Docks, 6 Jul 1974, 13 Jun 1975.

Antarctic Tern ***Sterna vittata***. Counts of up to 5 birds, winter plumage, on departure Tristan anchorage, 29 Jun 1974, 27 Jun 1975.

Tristan Thrush ***Nesocichla eremita***. On Tristan, single bird on slope above 1961 volcano, frequenting a small clump of Island Trees *Phylica arborea*, 22 Jun 1974. It did not allow a close approach.

Discussion

This is possibly the first record of seabirds at sea between Cape Town, Gough Island and Tristan da Cunha in the mid-winter months of June and July. M.E. Richardson (1984: 126) had two complete winters on Tristan itself, in 1973 and 1974, but without leaving the main island in the period March-August, while the Gough Island Scientific Survey Expedition in 1955-56 (Holdgate 1958) was at Tristan and Gough between October and May - in spring to late autumn.

The Grey, Great-winged, and endemic Atlantic Petrels are the only winter-breeding seabirds at Tristan and Gough (Richardson 1984, Ryan 2007). In the Tristan da Cunha group the three species may also breed on the plateau at Inaccessible Island, and possibly High Ridge on Nightingale Island, but this is not proven, doubtless due to the lack of scientific visits during the winter. At Gough and Tristan the chicks are heavily preyed upon by mice and rats (Cooper 2006, Ryan 2007), due to shortages of more regular food items plentiful in the summer. On Tristan there are under 100 pairs each of Grey and Atlantic Petrels, and under 1000 of Great-winged Petrels (Ryan 2007). The presence of breeding populations on Inaccessible and Nightingale Islands, being rat and mouse free, should therefore be significant in ensuring the survival of these species in the Tristan da Cunha group, most importantly the endemic Atlantic Petrel.

The lack of sightings at Gough and Tristan of familiar local summer-breeding species, including the Northern Rockhopper Penguin *Eudyptes (chrysocome) moseleyi*, Yellow-nosed Albatross *Thalassarche chlororhynchos*, Sooty Albatross and Great Shearwater *Puffinus gravis*, is due to their dispersal at sea, and absence on migration, during the winter months (Ryan 2007). While the Antarctic Tern also disperses, a few stragglers remain all year round (Ryan 2007, pers. obs.).

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References

Cooper, J. and Ryan, P.G. 1994. *Management Plan for the Gough Island Wildlife Reserve, Edinburgh, Tristan da Cunha*. Government of Tristan da Cunha.

Cooper, J. 2006. *Ridding Tristan and Gough of rats and mice*. Tristan da Cunha Newsletter 38: 14-15.

Harrison, P. 1983. *Seabirds - an Identification Guide*. Beckenham, Kent: Croom Helm.

Holdgate, M. 1958. *Mountains in the Sea*. The story of the Gough Island expedition. London: Macmillan.

Richardson, M.E. 1984. *Aspects of the ornithology of the Tristan da Cunha group and Gough Island, 1972-1974*. Cormorant 12: 121-201.

Rowlands, B.W. 1976. *Voyage to Tristan da Cunha [13 June to 3 July, 1975 - short note]*. The Cormorant 1: 13.

Rowlands, B.W. 1994. *A sea-birding cruise to Tristan da Cunha, 20 January to 2 February, 1993*. Sea Swallow 43: 64-68.

Rowlands, B.W. 2006. *Birds on the Tristan da Cunha quincentenary voyage, between Cape Town, the Tristan group and Gough Island, 30 January-17 February 2006*. Sea Swallow 55: 18-31.

Ryan, P.G. (Ed.) 2007. *Field Guide to the animals and plants of Tristan da Cunha and Gough Island*. Newbury, UK: Pisces Publications.

Tasker, M.L., Jones, P.H., Dixon, T. and Blake, B.F. 1984. *Counting seabirds at sea from ships: a review of methods employed and a suggestion for a standardised approach*. Auk 101: 567-577.

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THE DIET OF ALBATROSSES AND PETRELS IN BRAZIL: A REVIEW OF CURRENT KNOWLEDGE

By Fernanda Imperatrice Colabuono

Abstract

Brazilian waters are an important feeding ground for many species of albatrosses and petrels during the winter period. However, studies on diet in Brazil are available only for four albatross and six petrel species. Cephalopods (mainly the squid family Histioteuthidae) are the most representative item in the diet of the Southern Fulmar, Great Shearwater, Manx Shearwater, Sooty Shearwater, White-chinned Petrel and Spectacled Petrel. Fish (mainly Scianidae) dominate the diet of the Black-browed Albatross and Atlantic Yellow-nosed Albatross. Crustaceans are minor components in the diet of albatrosses and petrels during migration. Gastropods, insects and birds are also reported for some of these Procellariiformes. Further studies with qualitative and quantitative data on the diet of abundant species of albatrosses and petrels in Brazil and that have conservationist interest are very important to improving knowledge on these birds in the southwestern Atlantic ecosystem and evaluating the influence of human activity on their populations.

Introduction

Albatrosses and petrels (Procellariiformes) represent the majority of pelagic birds in oceans worldwide and play an important role as predators in marine ecosystems (Prince & Morgan 1987). Brazilian waters are important feeding grounds for these birds, where approximately 40 migratory species from both the southern and northern hemispheres have been recorded (Harrison 1985, CBRO 2008), along with three resident species of petrels (Sick 1997, Olmos *et al.* 2001, Soto & Filippini 2003, Imber 2004).

The highest abundance of albatrosses and petrels occurs in southern and southeastern waters of Brazil (Neves *et al.* 2006). Southern Brazil is a highly productive area due to the interaction between the Brazilian current, Falkland current and continental discharge. Thus, important seabird prey are concentrated in this region (Selliger *et al.* 1998), making it one of the most important feeding grounds during the migration period of a number of different Procellariiformes. Therefore, studies on the diet of albatrosses and petrels in Brazil are concentrated in southern Brazil.

The majority of studies on the feeding habits of Procellariiformes have been carried out in breeding colonies, where the birds are more accessible (Prince & Morgan 1987, Cherel & Klages 1997). However, there is little information on feeding habits during the migration season and a serious lack of knowledge regarding the biology and ecology of these birds (Prince & Morgan 1987). In Brazil, studies on feeding habits are only available for 10 species of Procellariiformes (four albatrosses and six petrels), including species of higher occurrence, such as the albatrosses *Thalassarche* spp., the petrels *Procellaria* spp. and *Puffinus* spp.

The analysis of stomach contents of seabirds outside of their reproductive colonies can provide valuable information on their feeding habits during migration, which is a very important part of the life cycle of these birds.

Study & Methods

Several methods can be employed to study the diet of Procellariiformes (Cherel & Klages 1997, Barrett *et al.* 2007). Studies on diet in breeding colonies are normally made by collecting regurgitates from adults or chicks in the nest. The main method employed in Brazil is stomach content analysis of birds found washed ashore or incidentally caught by fisheries.

Studies on diet based on dead birds allow the analysis of prey present in both the proventriculus and ventriculus, unlike regurgitate analysis, which only involves the contents of the proventriculus and, like most diet analysis methods, does not reveal the contents of the ventriculus (Warhan 1996). From the shapes and sizes of hard structures such as otoliths and cephalopod beaks (Figure 1), it is possible to identify prey families and even species as well as to estimate their mass and size (Clarke 1986, Warhan 1996, Haimovici & Velasco 2000). Such identification is difficult and time-consuming, often requiring the use of specialized reference collections, atlases, keys (e.g. Clarke 1986, Corrêa & Vianna 1992, Santos & Haimovici 1998) and the collaboration of specialists.

Figure 1. Otoliths (left) and cephalopod beaks (right) are usually found in stomach contents of albatrosses and petrels. Photograph by the author.

Nevertheless, it is necessary to be cautious when considering this type of data, because hard parts, such as cephalopod beaks, are more resistant to digestion than otoliths and therefore accumulate more, mainly in the ventriculus (Colabuono & Vooren 2007, Jackson & Ryan 1986, Furness *et al.* 1984). This tends to lead to an overestimation of the squid contribution to the overall diet (Croxall & Prince 1996). Moreover, due to this accumulation of hard structures in the digestive tract for long periods of time, it is possible to find prey during the migration season that were in fact ingested when these birds were still close to breeding colonies. This point should be considered when interpreting results obtained from the diet analysis of Procellariiformes.

The present study performs a review of published information on the diet of Procellariiformes found in Brazil during their migration season.

Prey classes

Cephalopods are the most frequent items found in the stomach contents of the Southern

Fulmar *Fulmarus glacialoides*, Great Shearwater *Puffinus gravis*, Manx Shearwater *Puffinus puffinus*, Sooty Shearwater *Puffinus griseus*, White-chinned Petrel *Procellaria aequinoctialis* and Spectacled Petrel *Procellaria conspicillata*, while fish represent the items with greatest frequency of occurrence in the Black-browed Albatross *Thalassarche melanophris* and Atlantic Yellow-nosed Albatross *Thalassarche chlororhynchos* (Table 1). However, petrels tend to accumulate more cephalopod beaks in the ventriculus than albatrosses (Colabuono & Vooren 2007) due to differences in the morphology of the digestive tract between the two classes (Diomedeidae and Procellariidae) (Ryan 1988). Other prey, such as crustaceans, gastropods, insects and birds, are also reported.

Table 1. Frequency of occurrence of prey groups found in the diet of eight Procellariiformes species investigated in Brazil.

	Frequency of occurance %						
Species	**Cephalopod**	**Fish**	**Crustaceans**	**Gastropods**	**Insects**	**Birds**	**Reference**
Southern Fulmar	100	4.7	2.4	2.4	21.4	-	Fonseca & Petry 2007
Great Shearwater	96.0	32.0	1.0	5.0	10.0	1.0	Petry *et al.*2008
Manx Shearwater	56.0	52.0	-	8.0	16.0	-	Petry et al.2008
Sooty Shearwater	76.0	53.0	-	-	29.0	-	Petry et al.2008
White-chinned Petrel	91.0	41.0	-	-	-	-	Colabuono & Vooren 2007
Spectacled Petrel	86.0	29.0	-	-	-	-	Colabuono & Vooren 2007
Black-browed Albatross	32.0 56.0	66.0 67.0	9.0 2.0	5.7 -	2.9 -	- 2.0	Petry et al. 2007 Colabuono & Vooren 2007
Atlantic Yellow-nosed Albatross		38.0	58.0	-	-	-	Colabuono & Vooren 2007

Cephalopods. A total of 24 taxa from 18 families have been identified (Appendix 1). Squids are represented mainly by the families Histioteuthidae, Ommastrephidae, Loliginidae, Lycoteuthidade and Gonatidae. Squids of the family Histioteuthidae occurs in eight of the ten species investigated. They are the most frequent cephalopod found in the Southern Fulmar (Frequency of Occurrence – FO%=70%), Spectacled Petrel (FO%=71%); White-chinned Petrel (FO%=38%), Black-browed Albatross (FO%=22%), Atlantic Yellow-nosed Albatross (FO%=20%) and the only squid that could be identified in Northern Royal Albatross *Diomedea sanfordi* (Carlos *et al.* 2004a). For most of that bird species, these squids are also the most representative cephalopod in number (Colabuono & Vooren 2007, Fonseca & Petry 2007). *Histioteuthis* sp. A is distributed mainly in subtropical waters and *Histioteuthis* sp. B occurs in sub-Antarctic waters (Xavier *et al.* 2003) and therefore could be captured both before and during migration.

Most of the cephalopod species found are recorded for the southern coast of Brazil. Oceanic species, such as the squid *Illex argentinus*, occur in the diet of the Black-browed Albatross, Atlantic Yellow-nosed Albatross, Great Shearwater and White-chinned Petrel. This squid is dominant on the outer continental shelf and upper slope off southern Brazil (Haimovici &

Perez 1991, Santos & Haimovici 1997). Coastal-water cephalopods, such as the squid *Loligo sanpaulensis* and *Octopus vulgaris*, are also found. *Loligo sanpaulensis* is the most abundant coastal squid in southern Brazil (Andriguetto & Haimovici 1991, Santos & Haimovici 1998) and is probably a potentially available prey to birds during its vertical migrations to the surface (Mello *et al.* 1992) or when adults die after reproduction and their carcasses float on the surface (Barón & Ré 2002).

Argonauta nodosa are very representative in the diet of Great, Manx and Sooty Shearwaters (Petry *et al.* 2008). This cephalopod is an epipelagic species with worldwide distribution in tropical and warm–temperate waters (Roper *et al.* 1984) and occurs in coastal waters off southern Brazil (Haimovici & Perez 1991).

Lycoteuthis lorigera has been found in 17% of the stomachs of Southern Fulmars (Fonseca & Petry 2007), in 2.9% of Black-browed Albatrosses (Petry *et al.* 2007) and also in stomach contents of *Diomedea epomophora* (Petry *et al.* 2001). This squid is widely distributed from 30°N to 50°S (Clarke 1986) and is also found along the coast of the state of Rio Grande do Sul (southern Brazil) (Haimovici & Perez 1991). *Loligo plei* is found in the diet of the Southern Fulmar and Great Shearwater and, like *L. lorigera*, is characteristic of the subtropical region (Haimovici & Andrigueto-Filho 1986, Croxall & Prince 1996).

Gonatus antarcticus is found in the diet of Sooty Shearwater, Black-browed and Atlantic Yellow-nosed Albatrosses. *Gonatus antarcticus* is the only species of this genus that occurs in South Hemisphere, in Antarctic and sub-Antarctic waters (Croxall & Prince 1994, Xavier *et al.* 2003). The presence of cephalopod beaks from Antarctic and sub-Antarctic regions indicates the long period of time prey can remain in the digestive tracts of these birds. The same occurs with the squids *Mesonychoteuthis hamiltoni* and *Alluroteuthis antarctica* (Lipinski & Jackson 1989) found in stomach contents of the Southern Fulmar.

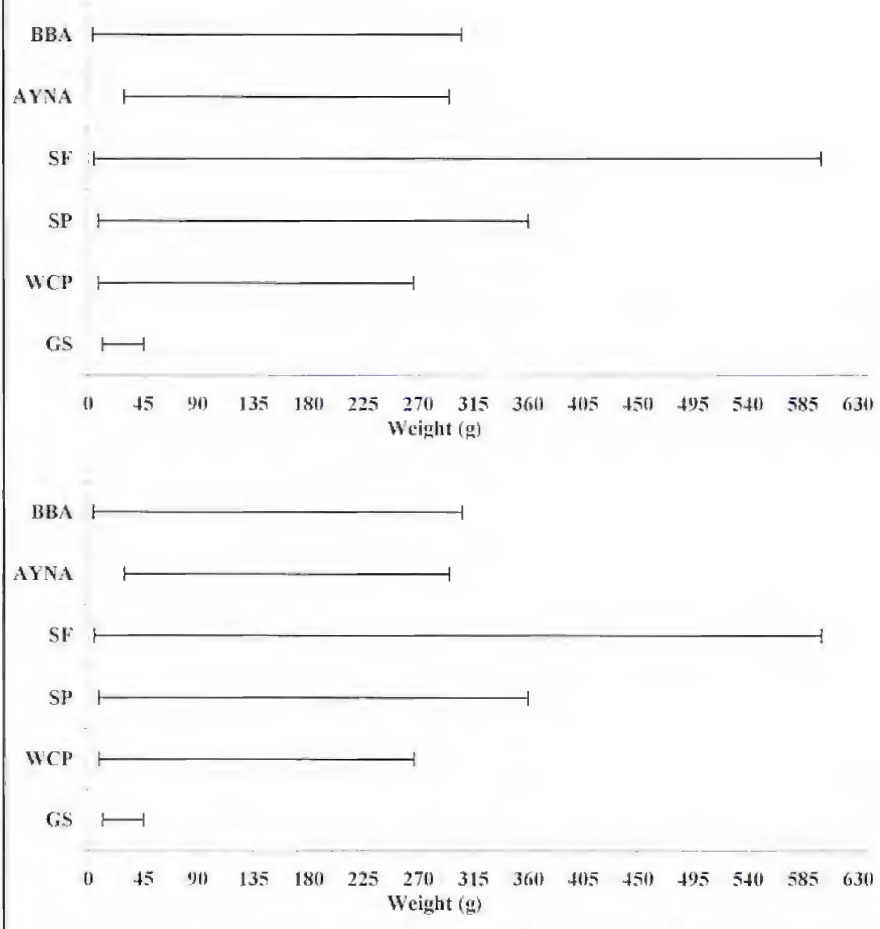
The cephalopods *Cycloteuthis* sp., *Grimalditeuthis* sp. and *Ommastrephes bartrami* are found in the stomach contents of the Royal Albatross *Diomedea epomophora* (Petry *et al.* 2001). *Ommastrephes bartrami* occurs in the eastern Pacific Ocean and west of Australia (Clarke 1986) and are also recorded in the waters off southern Brazil (Haimovici & Perez 1991). *Cycloteuthis* sp. occurs in the North Atlantic Ocean (30°N), Indian Ocean and western Pacific Ocean (Clarke 1986) and *Grimalditeuthis* sp. was recorded by Imber (1992) only for the New Zealand region. It is suggested that this cephalopod had been ingested close to breeding ground and remained in the digestive tract until its arrival to the coast of South America.

Bioluminescence occurs in most of the cephalopods found in the diet of the species investigated. In the Southern Fulmar, 86% of the cephalopods belong to bioluminescent species (Fonseca & Petry 2007). Among all cephalopods (at least nine different species) found in stomach contents of the Great, Manx and Sooty Shearwaters, only one (*Argonauta nodosa*) is not a bioluminescent species (Imber 1992). This suggests that night foraging is probably a common behaviour of shearwaters.

Some cephalopods are adapted to great depths (e.g. the genera *Gonatus*, *Histioteuthis* and *Cycloteuthis*). Birds can prey on these species either by fishing vessel discards, when the cephalopods perform vertical migrations or when they float after death and thus are available on the ocean surface (Lipinski & Jackson 1989, Imber 1992).

Figure 2 displays the amplitude of the reconstituted mass and size of cephalopods found in the diet of six Procellariiformes. In general, the Great Shearwater feeds on lighter prey (12 to 45 g) than the other larger bird species. The cephalopods consumed by the other species vary greatly in terms of mass (2.0 to 600 g) and size (mantle length - 8.5 to 252.4 mm). However, albatrosses and petrels can tear and rip prey apart before ingestion and, in some cases, they do not ingest the entire item (Thompson & Riddy 1995). When this occurs, the consumed mass does not correspond to the reconstituted mass of the prey. Therefore, we must be cautious when considering reconstituted mass, for the way in which these birds catch their prey can influence the interpretation of the results.

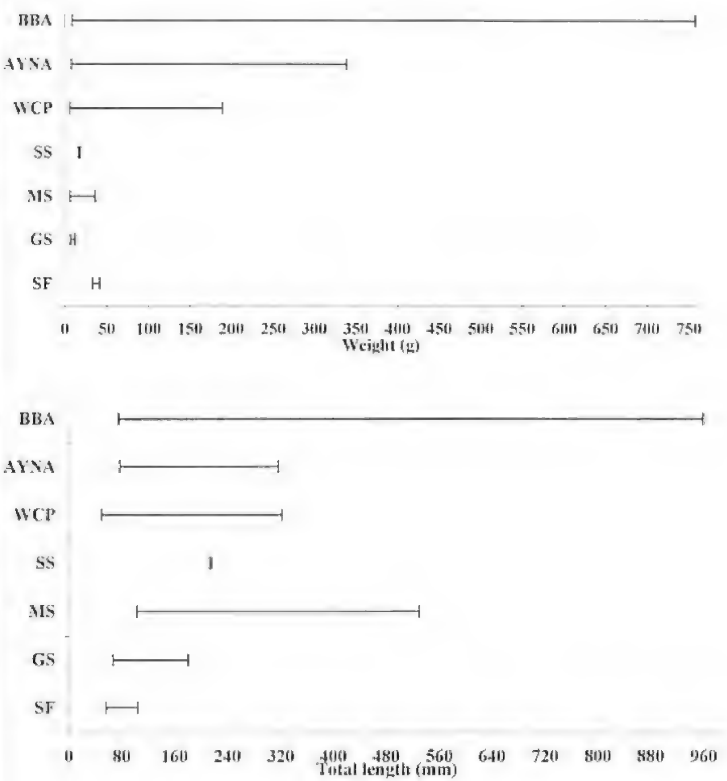
Figure 2. Amplitude of the reconstituted mass and mantle length of cephalopods found in the diet of Black-browed Albatross (BBA), Atlantic Yellow-nosed Albatross (AYNA), Southern Fulmar (SF), Spectacled Petrel (SP), White-chinned Petrel (WCP) and Great Shearwater (GS).



References: Colabuono & Vooren 2007; Fonseca & Petry 2007 & Petry et al.2008

Fish. A total of 19 fish taxa belonging to 12 families are found in the diets of eight Procellariiformes (Appendix 2). Scianidae are the most representative family in number and frequency for the Black-browed Albatross, Southern Fulmar, Great Shearwater, Sooty Shearwater and Manx Shearwater. *Ctenosciena gracilicirrhus*, which is also a Scianidae species, is the only fish found in the stomach contents of the Royal Albatross. This is a bioluminescent species restricted to the Atlantic Coast from Central America to southern Brazil (Menezes & Figueiredo 1980).

Figure 3. Amplitude of the reconstituted mass and total length of fish found in the diet of Black-browed Albatross (BBA), Atlantic Yellow-nosed Albatross (AYNA), Southern Fulmar (SF), White-chinned Petrel (WCP), Sooty Shearwater (SS), Manx Shearwater (MS) and Great Shearwater (GS).



References: Colabuono & Vooren 2007; Fonseca & Petry 2007 & Petry et al.2008

Paralonchurus brasiliensis is the most frequent fish found in Great, Sooty and Manx Shearwaters (Petry *et al.* 2008). This fish is also found in diet of the Southern Fulmar and Black-Browed Albatross (Colabuono & Vooren 2007, Fonseca & Petry 2007, Petry *et al.* 2007). Like other fish found in food contents, such as *Prionotus punctatus*, *Cynoscion guatucupa*, *Umbrina*

canosai, *Macrodon ancylodon*, *Urophycis brasiliensis*, *Micropogonias furnieri*, *Trichiurus lepturus* and *Porichthys porosissimus*, this species is abundant on the continental shelf off southern Brazil (Haimovici *et al.* 1996).

According to Croxall & Prince (1996), larger birds, such as albatrosses, normally feed on larger prey than petrels. The largest fish are found in the stomach contents of the Black-browed Albatross, but with great variation in mass and size, ranging from 8.4 to 758.2 g and 75 to 959.6 mm (Figure 3). However, the reconstituted mass and size of the fish ingested by some petrels is sometimes larger than that found in some albatrosses, as happens with cephalopods. As stated above, this likely occurs because these birds sometimes only ingest only part rather than the entire prey.

Crustaceans. Crustaceans are found in the stomach contents of the Southern Fulmar, Great Shearwater and Black-browed Albatross (Table 1). They are apparently minor components in the diet of albatrosses and petrels during the migration season (Petry *et al.* 2008). During the breeding period, some euphausiid crustaceans, mainly the Antarctic krill, are particularly important in the diet of Procellariiformes, such as the Black-browed Albatross from the Falkland and South Georgia Islands (Prince 1985, Thompson 1992), the Sooty Shearwater in New Zealand colonies (Kitson *et al.* 2000, Cruz *et al.* 2001), the White-chinned Petrel on South Georgia Island (Berrow & Croxal 1999) and the Southern Fulmar on the Rauer Islands (Arnould & Whitehead 1991).

Decapodas occur in 2 to 3% of the stomachs of the Black-browed Albatross collected off southern Brazil (Colabuono & Vooren 2007, Petry *et al.* 2007). Isopodas have been found in the stomach contents of the Southern Fulmar and Great Shearwater (Fonseca & Petry 2007, Petry *et al.* 2008).

Other dietary material. Insects have been found in the stomach contents of four petrel species (Table 1). Coleopters are the most frequent insects found in the Southern Fulmar (FO%=19%), Great Shearwater (FO%=3%), Manx Shearwater (FO%=4%) and Sooty Shearwater (FO%=18%). Coleopters also occur in the Black-browed Albatross (FO%=2.9%), but, in this case, they may have been ingested indirectly through the ingestion of larger preys, such as fish containing these insects in their digestive tract (Petry *et al.* 2007). The giant water bug, a Hemiptera from the family Belostomatidae, was recorded in five Manx Shearwaters and one Southern Fulmar (Fonseca & Petry 2007, Petry *et al.* 2008).

Gastropods have been found in the stomach contents of the Great Shearwater, Manx Shearwater, Southern Fulmar and Black-browed Albatross (Table 1). Gastropod shells found in a Southern Fulmar measured 3 mm in length (Fonseca & Petry 2007). In the Black-Browed Albatross, gastropods occur in 5.7% of stomachs (Petry *et al.* 2007), but like other items such as insects, this is probably due to secondary ingestion.

Two birds have been found in the stomach contents of Procellariiformes found dead ashore in Brazil. The remains of a Wilson's Storm Petrel *Oceanites oceanicus* was found in a Great Shearwater specimen (Petry *et al.* 2008) and a Tern *Sterna* spp. was found in the stomach of a Black-browed Albatross (Colabuono *et al.* 2006). Birds have been previously found in the stomach contents of several albatross species, but do not appear to be common in the diet of petrels (with exception of Giant petrels). Cherel & Klages (1997) listed at least 12 seabird species from two orders (Sphenisciformes and Procellariiformes) found in the stomach

contents of seven albatross species. Seco Pon & Gandini (2008) report a Wilson's Storm Petrel *Oceanites oceanicus* in the stomach contents of a Black-browed Albatross. Albatrosses may take seabirds alive or consume the carrion that they find floating on the ocean surface (Murphy 1936, del Hoyo *et al.* 1992, Cherel & Klages 1997).

Table 2. Some fish and cephalopods found in food contents of Procellariiformes studied in Brazil and their relationships with fisheries. Royal Albatross (RA), Black-browed Albatross (BBA), Atlantic Yellow-nosed Albatross (AYNA), Southern Fulmar (SF), White-chinned Petrel (WCP), Sooty Shearwater (SS), Manx Shearwater (MS) and Great Shearwater (GS).

Taxa	Procellariiformes species	Fisheries relationship	Reference
Fish			
Gempylidae			
Thyrsitops lepidopoides	WCP	Caught by oceanic commercial fisheries Discarded by trawl fisheries	Nakamura & Parin 1993; Haimovici & Mendonça 1996a
Scombridae			
Scomber japonicus	WCP	Used as bait in commercial pelagic longline fisheries	Vaske & Castello 1998
Sciaenidae			
Ctenosciaena gracilicirrhus	SF, GS, BBA, RA	Caught in comercial fishing and used as bait fish Caught as by-catch by shrimp trawl fisheries	Cervigón 1993 Gomes & Chaves 2006
Cynoscion guatucupa	GS, MX, WCP, BBA		
Cynoscion striatus	SF		
Paralonchurus brasiliensis	GS, MS, SS, BBA		
Macrodon ancylodon	BBA		Cervigón 1993; Ruffino & Castello 1993; Haimovici et al. 1996; Haimovici & Mendonça 1996a; Severino-Rodrigues et al. 2007
Umbrina canosai	AYNA		
Micropogonias furnieri	WCP, BBA, AYNA	Caught in commercial fishing and frequently discard by trawl fisheries	
Batrachoididae			
Porichthys porosissimus	SF,GS, MS, WCP, BBA, AYNA		
Trichiuridae			
Trichiurus lepturus	GS, MS, WCP, BBA		
Triglidae			
Prionotus punctatus	BBA		
Mugilidae			
Mugil spp.	BBA		
Phycidae			
Urophycis brasiliensis	BBA		
Cephalopod			
Ommastrephidae			
Illex argentinus	GS, WCP, BBA, AYNA	Used as bait in longline fisheries	Neves & Olmos 1997
Loliginidae			
Loligo sanpaulensis	GS, BBA	Caught as by-catch by shrimp trawl fisheries	Haimovici & Mendonça 1996b
Loligo plei	SF, GS	Caught as by-catch by trawl fisheries	Perez 2002

Relationship between Procellariiformes and fisheries. Albatrosses and petrels are commonly observed interacting with fishing boats (Vaske Jr. 1991, Neves & Olmos 1997). Fisheries may affect the diet of Procellariiformes by increasing the availability of food items and providing prey species unavailable to these birds under natural conditions (Cherel & Klages 1997). Table 2 displays prey found in the stomach contents of albatrosses and petrels studied in Brazil and their relationship with fisheries. At least 40% of all identified species of fish and cephalopods have some relationship with fisheries (e.g. bait, by-catch and discarded species).

Procellariiformes can obtain a substantial amount of food by scavenging dead cephalopods and fish and care is needed when evaluating trophic interactions between seabirds and fisheries only by the importance of demersal and semipelagic prey in their diet (Cherel *et al.* 2000). However, when combining that information with other characteristics, like range size of prey and species composition, and compare with those often discarded by the fisheries, it is possible to suggest the probable origin of the prey.

Cephalopods seem to be the preferential prey of most Procellariiformes and are also very often used as bait (e.g. *Illex argentinus*) in longline fishery operations (Neves & Olmos 1997), which is a great attractive for birds.

Some demersal fish species, such as *Prionotus punctatus*, *Umbrina canosai*, *Macrodon ancylodon*, *Urophycis brasiliensis*, *Paralonchurus brasiliensis*, *Micropogonias furnieri* and *Porichthys porosissimus*, are available to these birds after being discarded and found floating on the ocean surface. These fish are often discarded by trawl fisheries in southern Brazil either due to their low commercial value or their small size (Ruffino & Castello 1993, Haimovici *et al.* 1996, Haimovici & Mendonça 1996a).

The remains of elasmobranchs have also been found in stomach contents (Colabuono & Vooren 2007). They probably were ingested after being discarded around fishing vessels. Discards are mainly made up of elasmobranchs and small fish, representing c. 50% and 20% of the total catch in double-rig trawl fisheries targeting fish and shrimp, respectively, in southern Brazil (Haimovici & Mendonça 1996a).

The opportunistic use of discards from vessels as a food source for birds is important evidence of the interaction between seabirds and fishery activities. This interaction can often have serious consequences for these birds, such as mortality by incidental catches, which is a well established fact in Brazil (e.g. Vaske Jr. 1991, Neves & Olmos 1997, Neves *et al.* 2001, Bugoni *et al.* 2008).

Closing remarks

A great diversity of seabirds use coastal and oceanic waters off Brazil as feeding grounds. Although Procellariiformes are more abundant in the southern and southeastern regions of Brazil, there are plenty of records of these birds in other regions of the country (Lima *et al.* 2001, Lima *et al.* 2004, Carlos *et al.* 2004b, Bugoni *et al.* 2008). Brazil has an extensive coastline, where beached birds are often found, which allows the collection of a reasonable number of samples. Furthermore, fishery activity, which unfortunately has caused considerable mortality to Procellariiformes, is another way to obtain a large number of specimens. However, studies on the diet of these birds in Brazil remain scarce, concentrated in a single region and for only about 25% of Procellariiformes species that occur in the country. There is a lack of studies on the feeding habits of species of high conservationist interest, such as the Wandering Albatross *Diomedea exulans* and Tristan Albatross *D. dabbenena*, or on small Procellariiformes, such as Prions *Pachyptila* spp. and Wilson's Storm Petrel, which are also abundant in Brazilian waters (Belton 1984, Vooren & Fernandes 1989, Sick 1997). This information is very important for a better understanding of the role of these seabirds in the southwestern Atlantic ecosystem as well as for evaluating the potential of species as fishing competitors and the influence of human activities on their populations.

References

Andriguetto-Jr, J. & Haimovici, M. (1991). *Abundance and distribution of Loligo sanpaulensis Brakoniecki, 1984 (Cephalopoda, Loliginidae) in southern Brazil*. Scientia Marina, 55: 611–618.

Arnould, J. P. Y. & Whitehead, M. D. (1991). *The diet of Antarctic petrel, Cape petrels and Southern fulmars rearing chicks in Prydz Bay*. Antarctic Science 3: 19–27

Barón, P.J. & Ré, M.E. 2002. *Reproductive cycle and population structure of Loligo sanpaulensis of the Notheastern coast of Patagonia.* Bulletin of Marine Science 71: 175–186.

Barrett, R. T., Camphuysen, C. J., Anker-Nilssen, T., Chardine, J. W., Furness, R. W., Garthe S., Hüppop, O., Leopold, M. F., Monteveechi W. A. & Veit, R. R. (2007). Diet studies of seabirds: a review and recommendantions. *ICES Journal of Marine Science* 64: 1675–1691.

Belton, W. (1984). *Birds of Rio Grande do Sul, Brazil. Part I. Rheide through Furnariidae.* Bulletin of the American Museum of Natural History 178: 369–631.

Berrow, S. D. & Croxall, J. P. (1999). *The diet of white-chinned petrels Procellaria aequinoctialis, Linnaeus 1758, in years of contrasting prey availability at South Georgia.* Antarctic Science 11: 283–292.

Bugoni, L., Neves, T. S., Leite-Jr., N. O., Carvalho D., Sales, G., Furness, R. W., Stein, C. E., Peppes, F. V., Giffoni, B. B. & Monteiro, D. S. (2008). *Potential bycatch of seabirds and turtles in hook-and-line fisheries of Itaipava Fleet, Brazil.* Fisheries Research 90: 217–224.

Carlos, C. J., Colabuono, F. I. & Vooren, C. M. (2004a). *Notes on the Northen Royal Albatross Diomedea sanfordi in south Brazil.* Ararajuba: Revista Brasileira de Ornitologia 12: 166–167.

Carlos, C. J., Trimble, J. & Fedrizzi, C. E. (2004b). *A specimen of Cape Petrel Daption capense from north-east Brazil.* Bulletin of the British Ornithologis' Culb 124: 287–290.

Cervigón, F. (1993). *Los peces marinos de Venezuela*, vol 2. Fundácion Científica los Roques, Caracas.

Cherel, Y. & Klages, N. (1997). *A review of the food of albatrosses.* Pp. 113–136. *in*: Robertson, G. & Gales, R. (eds.) *Albatross biology and conservation.* Surrey Beatty & Sons, Chipping Norton.

Cherel, Y., Weimerskirch, H. & Trouvé, C. (2000). *Food and feeding ecology of the neritic-slope forager black-browed albatross and its relationships with commercial fisheries in Kerguelen waters.* Marine Ecology Progress Series 207: 183–199.

Clarke, M. R. (1986). *The handbook for the identification of cephalopod beaks.* Claredon Press, Oxford, UK.

Colabuono, F. I., Fedrizzi, C. E. & Carlos, C. J. (2006). *A Black-browed Albatross Thalassarche melanophris consumes a tern Sterna sp.* Marine Ornithology 34: 167–168.

Colabuono, F. I. & Vooren, C. M. (2007). *Diet of Black-browed Thalassarche melanophrys and Atlantic Yellow-nosed T. chlororhynchos albatrosses and White-chinned Procellaria aequinoctialis and Spectacled P. conspicillata petrels off southern Brazil.* Marine Ornithology 35: 9–20.

Comitê Brasileiro de Registros Ornitológicos [Brasilian Committee of Ornithological Records] (2008). *Listas de aves do Brasil.* Available at < http://www.ib.usp.br/cbro> (Accessed on 18 May 2009).

Côrrea, M. F. M. & Vianna, M. S. (1992). Catálogo de otólitos de Scianidae (Osteichthyes–Perciformes) do litoral do estado do Paraná, Brasil. *Nerítica* 7: 13–41.

Croxall, J. P. & Prince, P. A. 1994. *Dead or alive, night or day: how do albatrosses catch squid?* Antarctic Science 6: 155–162.

Croxall, J. P. & Prince, P. A. (1996). Cephalopods as prey 1. Seabirds. *Philosophical Transactions of the Royal Society B* 351: 1023–1043.

Cruz, J. B., Lalas, C., Jillett, J. B., Kitson, J. C., Lyver, P. O. B., Imber, M., Neuman, J. & Moller, H. (2001). *Prey spectrum of breeding Sooty Shearwaters (Puffinus griseus) New Zealand.* New Zealand Journal of Marine and Freshwater Research 35: 817–829.

del Hoyo, J., Elliot, A. & Sargatal, J. (1992). *Handbook of the birds of the world*, vol. 1. Lynx Edicions, Barcelona.

Fonseca, V. S. S. & Petry, M. V. (2007). *Evidence of food itmes used by Fulmarus glacialoides (Smith 1840) (Procellariiformes: Procellariidae) in Southern Brazil.* Polar Biology 30: 317–320.

Furness, B. L, Laugksch, R. C. & Duffy, D. C. (1984). *Cephalopod beaks and studies of seabird diets.* Auk 101: 619–620.

Gomes, I. D. & Chaves, P. T. (2006). *Ictiofauna integrante da pesca de arrasto camaroeiro no litoral sul do Estado do Paraná, Brasil.* Bioikos 20: 9–13.

Haimovici, M. & Andriguetto-Filho, J. M. (1986). *Cefalópodes costeiros capturados na pesca de arrasto do litoral sul do Brasil.* Arquivos de Biologia e Tecnologia 29: 473–495.

Haimovici, M., & Perez, J. A. A. (1991). *Coastal cephalopod fauna of Southern Brazil.* Bulletin of Marine Science. 49: 221–230.

Haimovici, M., Martins, A. S. & Vieira, P. C. (1996). *Distribuição e abundância de peixes teleósteos demersais sobre a plataforma continental do sul do Brasil.* Revista Brasileira de Biologia 56: 27–50.

Haimovici, M. & Mendonça, J. T. (1996a). Descartes da fauna acompanhante na pesca de arrasto de tangones dirigida a linguados e camarões na plataforma continental do sul do Brasil. *Atlântica.* 18: 161–177.

Haimovici, M. & Mendonça, J. T. (1996b). *Análise da pesca de arrasto de tangones de peixes e camarões no sul do Brasil.* Atlântica 18: 143–160.

Haimovici, M. & Velasco, G. (2000). *Length-weight relationship of marine fishes from southern Brazil.* Naga 23: 19–23.

Harrison, P. (1985). *Seabirds, an identification guide.* Houghton Mifflin Company, Boston.

Imber, M. J. (1992). *Cephalopods eaten by wandering albatrosses (Diomedea exulans L.) breeding at six circumpolar localities.* Journal Royal Society of New Zealand 22: 243–263.

Imber, M. J. (2004). *Kermadec Petrels (Pterodroma neglecta) at Ilha da Trindade, South Atlantic Ocean and in the North Atlantic.* Notornis 51: 33–40.

Jackson, S. & Ryan, P. G. (1986). *Differential digestion rates of prey by white-chinned petrels (Procellaria aequinoctialis).* Auk 103: 617–619.

Kitson, J. C., Cruz, J. B., Lalas, C., Jillet, J. B., Newman, J. & Lyver, P. O. B. (2000). *Interannual variations in the diet of breeding sooty shearwaters (Puffinus griseus).* New Zealand Journal of Zoology Abstracts 27: 357–365.

Lima, P. C., Lima, P. C., Grantsau, R., Lima R. C. R & Santos, S. S. (2001). Nota sobre os registros brasileiros de *Calonectris edwardsii* (Oustalet, 1883) e *Pelagrodoma marina hypoleuca* (Moquin-Tandon, 1841) e primeiro registro de *Phalacrocorax bransfieldensis* Murphy, 1936 para o Brasil. *Ararajuba: Revista Brasileira de Ornitologia* 12: 264–265.

Lima, P. C., Grantsau, R., Lima R. C. R & Santos, S. S. (2004). *Occurrence and mortality of seabirds along the northern coast of Bahia, and the identification key of the Procellariiformes order and Stercorariidae family. Atualidades Ornitológicas. 121.* Available at: <http://www.ao.br/download/seabirds.pdf> (Accessed on 18 May 2009).

Lipinski, M. R. & Jackson, S. (1989). *Surface-feeding on cephalopods by procellariiform seabirds in the sothern Benguela region, South Africa.* Journal of Zoology, London 218: 549–563.

Mello, R. M., Castello, J. P. & Freire, K. F. (1992). Asociacion de especies pelagicas marinas en el sur de Brasil durante invierno y primavera. *Frente Marítimo* 11: 63–70.

Menezes, N. A. & Figueiredo, J. L. (1980). *Manual de peixes marinhos do sudeste do Brasil. IV–Teleostei.* Univesidade de São Paulo, Museu de Zoologia, São Paulo.

Murphy, R. C. (1936). *Oceanic Birds of South America*, 2 vols. American Museum of Natural History, New York.

Nakamura, I. & Parin, N. V. (1993). *FAO species catalogue, vol. 15: Snake mackerels and cutlassfishes of the world (families Gempylidae and Trichiuridae). An annotated and illustrated catalogue of the snake mackerels, snoeks, escolars, gemfishes, sackfishes, domine, oilfish, cutlassfishes, scabbardfishes, hairtails, and frostfishes known to date.* Food and Agriculture Organization of the United Nations, Rome.

Neves, F. O. C., Bastos, G. C. C., Neves, T. S. (2001). *Pesca no céu, a morte de aves em espinhéis no Brasil.* Ciência Hoje 29: 24–32.

Neves, T., & Olmos, F. (1997). *Albatross mortality in fisheries off the coast of Brazil. Pp. 214-219 in: Robertson, G. & Gales, R. (eds.)* Albatross biology and conservation. Surrey Beatty & Sons, Chipping Norton.

Neves, T., Vooren, C. M., Bugoni, L., Olmos, F & Nascimento, L. (2006). Distribuição e abundância de aves marinhas na região sudeste-sul do Brasil. Pp. 11–35 *in*: Neves, T. Bugoni, L & Rossi-Wongtschowski, C. L. (eds.) *Aves oceânicas e suas interações com a pesca na*

Região Sudeste-Sul do Brasil Instituto Oceanográfico–USP (Série documentos Revizee: Score Sul), São Paulo

Olmos, F., Neves, T. S. & Bastos, G. C. C. (2001). A pesca com espinhéis e a mortalidade de aves marinhas no Brasil. Pp. 327–337 *in:* Albuquerque, J. B., Cândido-Jr, J. F, Straube, F. C. & Roos, A. (eds.) *Ornitologia e conservação: da ciência às estratégias*. Editora Unisul, Tubarão, SC.

Perez, J. A. A. (2002). Biomass dynamics of the squid *Loligo plei* and the development of a small-scale seasonal fishery off southern Brazil. *Bulletin of Marine Science* 71: 633–651.

Petry, M. V., Fonseca, V. S. & Sander, M. (2001). Food habits of the. Royal albatross, *Diomedea epomophora* (Lesson, 1825), at the seacost of Brazil. *Acta Biologica Leopoldensia* 23: 207–212.

Petry, M. V., Fonseca, V. S. S. & Scherer, A. L. (2007). *Analysis of stomach contents from the black-browed albatross, Thalassarche melanophris, on the Coast of Rio Grande do Sul, Southern Brazil*. Polar Biology 30: 321–325.

Petry, M. V., Fonseca, V. S. S., Krüger-Garcia, L., Piuco, R. C. & Brummelhaus, J. (2008). *Shearwater diet during migration along the coast of Rio Grande do Sul, Brazil*. Marine Biology 154: 613-621.

Prince, P. A. & Morgan, R. A. (1987). *Diet and feeding ecology of Procellariformes. Pp. 135-173 in: Croxall, J. P. (ed.) Seabirds: feeding ecology and role in marine ecosystems.* Cambridge University Press, Cambridge, UK.

Prince, P. A. (1985). *Population and energetic aspects of the relationship between Black-browed aand Grey-headed albatrosses and the Southern Ocean marine environment*. Pp. 473–477 *in*: Siegfried, W .R., Condy, P. R. & Laws, R. M. (eds.) Antarctic nutrient cycles and food webs. Springer-Verlag, Berlin.

Roper, C. F. E., Sweeney, M. J. & Nauen, C. E. (1984). *FAO Species catalogue, vol. 3: Cephalopods of the world*. Food and Agriculture Organization of the United Nations, Rome.

Ruffino, M. L. & Castello, J. P. (1993). *Alteração na ictiofauna acompanhante da pesca do camarão-barba-ruça (Artemesia longinaris) nas imediações da Barra do Rio Grande*, Rio Grande do Sul - Brasil. Nerítica 7: 43–55.

Ryan, P. G. (1988). *Effects of ingested plastic on seabird feeding: Evidence from chickens*. Marine Pollution Bulletin 19: 125–128.

Santos, R. A. & Haimovici, M. (1997). *Food and feeding of the short-finned squid Illex argentinus (Cephalopoda: Ommastrephidae) off southern Brazil*. Fisheries Research 33: 139–147.

Santos, R. A., & Haimovici, M.(1998). *Trophic relationships of the long-finned squid Loligo sanpaulensis on the Southern Brazilian shelf*. South African Journal of Marine Science 20: 81–91.

Seco Pon, J. P. & Gandini, P. A. (2008). *Black-browed Albatross Thalassarche melanophrys feeding on a Wilson's Storm petrel Oceanites oceanicus.* Marine Ornithology 36: 77–78.

Selliger, U., Odebrecht, C. & Castello, J. P. (1998). *Os ecossistemas costeiro e marinho do extremo sul do Brasil.* Editora Ecoscientia, Rio Grande.

Severino-Rodrigues, E., Hebling, N. J. & Graça-Lopes, R. (2007). *Biodiversidade no produto da pesca de arrasto-de-fundo dirigida ao lagostim, Metanephrops rubellus (Moreira, 1903), desembarcado no litoral do estado de São Paulo, Brasil.* Boletim do Instituto de Pesca, São Paulo 33: 171–182.

Sick, H. (1997). *Ornitologia Brasileira.* Editora Nova Fronteira, Rio de Janeiro.

Soto, J. M. R. & Filippini, A. (2003). *Ocorrência e reprodução da pardela-de-audubon, Puffinus lherminieri Lesson, 1839 (Procellariiformes, Procellariidae), no Arquipélago Fernando de Noronha, com a revisão dos registros de P. lherminieri e P. assimilis no Brasil. Ararajuba:* Revista Brasileira de Ornitologia 11: 264-267.

Thompson, K. R. & Riddy, M. D. (1995). *Utilization of offal and discards from 'finfish' trawlers around the Falkland Islands* by *Black-browed Albatross Diomedea melanophrys.* Ibis 137: 198–206.

Thompson, K .R. (1992). *Quantitative analysis of the use of discards from squid trawlers by Black-browed albatrosses Diomedea melanophris in the vicinity of the Falkland Islands.* Ibis 134: 11–21.

Vaske Jr, T. (1991). *Seabird mortality on longline fishing for tuna in southern Brazil.* Ciência e Cultura 43: 388–390.

Vaske Jr., T. & Castello, J. P. (1998). *Conteúdo estomacal da albacora-laje Thunnus albacares, durante o inverno e primavera no sul do Brasil.* Revista Brasileira de Biologia 58: 639–647.
Vooren, C. M. & Fernandes, A. C. 1989. *Guia de albatrozes e petréis do sul do Brasil.* Sagra, Porto Alegre.

Warham, J. (1996). *The behaviour, population biology and physiology of the petrels.* Academic Press, London.

Xavier, J. C., Croxall, J. P., Trathan, P. N., & Rodhouse, P. G. (2003). *Inter-annual variation in the cephalopod component of the diet of the Wandering Albatross, Diomedea exulans, breeding at Bird Island, South Georgia.* Marine Biology 142: 611–622.

Appendix 1. Cephalopods found in food contents of ten Procellariiformes species. Occurrence is represented by (•) and absence by (-).

Cepalopod taxa	Southern Fulmar	Great Shearwater	Manx Shearwater	Sooty Shearwater	White-chinned Petrel	Spectacled Petrel	Black-browed Albatross	Atlantic Yellow-nosed Albatross	Northern Royal Albatross	Royal Albatross
Gonatus spp.	-	•	-	-	-	-	-	-	-	-
Gonatus antarcticus	-	•	-	•	-	-	•	•	-	-
Illex argentinus	-	•	-	-	•	-	•	•	-	-
Ornithoteuthis sp.	-	-	-	-	-	-	-	•	-	-
Ommastrephes bartrami	-	-	-	-	-	-	-	-	-	•
Cycloteuthis sp.	-	•	-	-	-	-	-	-	-	•
Discoteuthis sp.	•	-	-	-	-	-	-	-	-	-
Ancistrocheirus lesueurii	•	-	-	-	-	-	•	-	-	-
Lycoteuthis sp.	•	•	•	-	-	-	•	-	-	-
Lycoteuthis lorigera	•	•	-	-	-	-	•	-	-	•
Histioteuthis spp.	•	•	•	-	•	•	•	•	•	-
Histioteuthis sp. A	-	-	-	-	•	-	•	•	-	-
Histioteuthis sp. B	-	-	-	-	•	•	•	•	-	-
Alluroteuthis antarctica	•	-	-	-	-	-	-	-	-	-
Chiroteuthis sp.	•	•	-	-	•	-	-	-	-	-
Mesonychoteuthis hamiltoni	•	-	-	-	-	-	-	-	-	-
Loligo sanpaulensis	-	•	-	-	-	-	•	-	-	-
Loligo plei	•	•	-	-	-	-	-	-	-	-
Grimalditeuthis sp	•	-	-	-	-	-	-	-	-	-
Argonauta nodosa	•	•	•	•	-	-	-	-	-	•
Octopus vulgaris	-	-	-	-	-	-	•	-	-	-
Haliphron atlanticus	-	-	-	-	-	-	•	-	-	-
Ocythoe tuberculata	-	-	-	-	•	-	•	-	-	-
Octopoteuthis spp.	-	-	-	-	-	•	-	-	-	-

References: Carlos et al. 2004a; Colabuono & Vooren 2007; Fonseca & Petry 2007; Petry et al. 2001; Petry et al. 2007 & Petry et al.2008

Appendix 2. Fish found in food contents of ten Procellariiformes species. Occurrence is represented by (•) and absence by (-).

Fish taxa	Southern Fulmar	Great Shearwater	Manx Shearwater	Sooty Shearwater	White-chinned Petrel	Spectacled Petrel	Black-browed Albatross	Atlantic Yellow-nosed Albatross	Northern Royal Albatross	Royal Albatross
Ctenosciaena gracilicirrhus	•	•	-	-	-	-	•	-	-	•
Cynoscion guatucupa	-	•	•	-	•	-	•	-	-	-
Cynoscion striatus	•	-	-	-	-	-	-	-	-	-
Pogonias cromis	-	-	-	-	-	-	•	-	-	-
Macrodon ancylodon	-	-	-	-	-	-	•	-	-	-
Umbrina canosai	-	-	-	-	-	-	-	-	-	•
Micropogonias furnieri	-	-	-	-	•	-	•	-	-	•
Paralonchurus brasiliensis	-	•	•	•	-	-	•	-	-	-
Pomatomus saltatrix	•	-	-	-	-	-	•	-	-	-
Porichthys porosissimus	•	•	•	-	•	-	•	-	-	•
Trichiurus lepturus	-	•	•	-	•	-	•	-	-	-
Prionotus punctatus	-	-	-	-	-	-	•	-	-	-
Lycengraulis grossidens	-	-	-	-	-	-	•	-	-	-
Mugil spp.	-	-	-	-	-	-	•	-	-	-
Urophycis brasiliensis	-	-	-	-	-	-	•	-	-	-
Malacocephalus occidentalis	-	-	-	-	-	-	-	-	-	•
Atherinella brasiliensis	-	-	-	-	•	-	-	-	-	-
Thyrsitops lepidopoides	-	-	-	-	•	-	-	-	-	-
Scomber japonicus	-	-	-	-	•	-	-	-	-	-

References: Carlos et al. 2004a; Colabuono & Vooren 2007; Fonseca & Petry 2007; Petry et al. 2001; Petry et al. 2007 & Petry et al.2008

RNBWS EXPEDITION TO DIEGO GARCIA - SATURDAY 27 OCTOBER TO FRIDAY 9 NOVEMBER 07

Antony D Tindale

Diego Garcia (DG) is one of many atolls that form the Chagos Archipelago. Despite the large United Kingdom and United States military presence on DG, the ornithological data for the atoll remain incomplete - a consequence of the very high level of security afforded to the strategically important atoll. It was therefore a privilege to be given the opportunity to add to the ornithological knowledge of DG by being selected as one of the five individuals to assist Major Pete Carr RM for the two-week expedition.

Stand fast the brief stay in Singapore the objective of the expedition was far more than just a leisurely 'birding' holiday on a tropical atoll in the middle of the Indian Ocean. The primary aim was to conduct the second and final stage of the Barton Point International Bird Area (IBA) seabird survey (phase one having been completed in May 2005) in order to establish whether or not breeding takes place continuously throughout the year within the established seabird colonies. The secondary aim was to compile a census of all the bird species present by exploring the entire atoll and regularly re-visiting the prime sites for new arrivals. Due to the presence of migratory routes in Africa to the West and Asia to the North and East it was hoped that one or more previously unreported species would turn up due to the prime location of Diego Garcia for wayward migrants. We were not disappointed.

The expedition began with a 0900 muster at London Heathrow's Terminal 3 in order to check in for a 1225 departure with Singapore Airlines. At 0800 (local) Sunday 28 Oct 07 after a twelve hour flight we landed at Singapore's Changi Airport where we were picked up and transported to the Park Royal Hotel courtesy of Ministry Of Defence staff. After the briefest of pit stops it was straight out for a day's birding, taking in the Lower Peirce Reservoir adjacent the Central Catchment Area and Sungei Buloh Nature Reserve in the North. Highlights of the day's birding included stunning regional specialities like Common Flameback (*Dinopium javanense*), Greater Racket-tailed Drongo (*Dicrurus paradiseus*), Brahminy Kite (*Haliastur indus*) and Collared Kingfisher (*Todiramphus chloris*) and large numbers of particular species that only occur in the UK in ones and twos such as Curlew Sandpiper (*Calidris ferruginea*) and Marsh Sandpiper (*Tringa stagnatilis*). After a shower and change of clothing it was decided to dine at the renowned 'Newton Circus' hawker centre where a variety of dishes were consumed and washed down with a Tiger beer or two.

Due to a 24-hour delay in our departure from Singapore to Diego Garcia we were treated to a second full day of birding in Singapore. Therefore, in addition to the planned morning visit to the overgrown Bukit Brown Cemetery we were also able to spend the afternoon at the Botanical Gardens. Despite heavy, dark and threatening cloud cover as we set off in taxis from the hotel we were blessed with reasonably dry weather and another good day of birding that turned up Scarlet-backed Flowerpecker (*Dicaeum cruentatum*), Banded Woodpecker (*Picus mineaceus*), Black-naped Oriole (*Oriolus chinensis*), Crimson Sunbird (*Aethopyga siparaja*), Brown-capped Woodpecker (*Dendrocopos nanus*) and Asian Koel (*Eudynamys scolopaceus*) to name a few.

Tuesday morning was our last opportunity to bird watch in Singapore and rather than suffer the frustrations of spotting birds within the canopy of the primary forest at Bukit Timah Nature Reserve we returned to the Botanical Gardens in order to stroll around the half of the

gardens that we had missed the day before. We were treated to two sightings of Arctic Warbler (*Phylloscopus borealis*) as well as many of the species seen on the previous two days.

Although the birding opportunities in Singapore were far from exhausted there was an element of relief when we finally departed Singapore for Diego Garcia from RSAF Paya Lebar military air base to begin the task that we were sponsored to undertake - even though the hospitality on the USAF KC-10, or lack of it, was in complete contrast to what we had become accustomed with Singapore Airlines. After a four hour flight we arrived in DG at 1750 (local) to be greeted by Common White Terns (*Gygis alba*) flying in ones and twos over the palm trees as the sun set.

Any notions that the routine 'on island' was going to be relaxed were soon found to be misguided, when after dropping off our luggage at our allocated accommodation we found ourselves searching for evidence of breeding Wedge-tailed Shearwater (*Puffinus pacificus*) along the shoreline of Downtown equipped with miners' lamps and torches. Although no evidence of Shearwater activity was found it was very evident that around the accommodation areas immature Brown Noddy (*Anous stolidus*), precariously perched in palm trees and on the ground, were still dependant on their parents for food.

The first full day on Diego Garcia began with a sea watch from Eclipse Point at 0715. En route introduced species, Madagascar Turtle-dove (*Nesoenas picturata*), Common Myna (*Acridotheres tristis*), Zebra Dove (*Geopelia striata*), Madagascar Red Fody (*Foudia madagascariensis*), Domestic Chicken (*Gallus gallus domesticus*) and Cattle Egret (Bubulcus ibis) were observed and found to be numerous. From the viewing point we encountered many of the expected species including Red-footed Booby (*Sula sula*), Greater Frigatebird (*Fregata minor*), Black-naped Tern (*Sterna sumatrana*), Crested Tern (*Sterna bergii*), Striated Heron (*Butorides striata*), Bridled Tern (*Sterna anaethetus*) and a single White-tailed Tropicbird (*Phaethon lepturus*).

It was next decided to take a tour of the island stopping off at the known good locations (Downtown Sewage Farm, Seabees Sewage Farm, Turtle Cove, etc) in order for the four new comers to Diego Garcia, of which I was one, to get familiar with the lie of the land. It turned out to be a cracking whistle stop tour and provided us with a taste of what was to come, with several rarities and two Chagos 'firsts' being seen and photographed. The first rarity was a single Oriental Pratincole (*Glareola maldivarum*) spotted on an open grass field that, due to the regular heavy downpours, had many temporary pools in the depressions. Although only temporary the pools drew the waders away from the permanent settling pools of the sewage works while they persisted. Another rarity was a pair of winter Garganey (*Anas querquedula*) spotted in flight at Pointe Marianne where there was a small freshwater pond at the end of the runway. The two Chagos 'firsts' were found at the incinerator site that contained freshwater pools and grassy areas. A juvenile Indian Pond-heron (*Ardeola* grayii) was spotted hunting for food in a pool adjacent to the incinerator oblivious to the noise and activity that was occurring only a few meters away. Nearby on one of the damp grassy areas a Pectoral Sandpiper (*Calidris* melanotos) was one of several species of wader searching for food. Other good sightings included 2 Little Stint (*Calidris minuta*), 3 White-winged Tern (*Chlidonias leucopterus*), 3 Pacific Golden Plover (*Pluvialis fulva*), Yellow Wagtail (*Motacilla flava ssp*), Glossy Ibis (*Plegadis falcinellus*) and Great Egret (Casmerodius *albus*).

On Thursday, with all admin having been completed, it was possible to get into a daily routine in order to achieve the aims of the expedition. Major Pete Carr, Lt/Col Roger Dickie and

Major Andrew Bray undertook the survey of the Barton Point IBA whilst CPO Chris Patrick, CPO Mark Cutts and I conducted the census of the rest of the islands bird life. All six team members were to be involved in surveying the seabird colonies on East, Middle and West Islands ensuring that everyone got an opportunity to get 'up, close and personal' with the Red-footed Boobies. Due to the dense vegetation that had grown over the gravel track North of Minni Minni the Barton Point team had to walk several kilometers over rough terrain to and from the randomly selected transacts on the seaward side of Barton Point. Access for any future expeditions should be much improved as work was underway, using explosives where necessary, to reopen the track to vehicles.

The highlights on Thursday and Friday included two more 'firsts' observed on a visit for fuel after returning to Downtown having picked up the Barton Point team. On previous expeditions the location had little potential because of the dense reeds. However, the reeds had for whatever reason been killed off and were only just starting to show signs of regeneration. Consequently the area now consisted of an open, flat marshy area that we referred to as the 'Fuel Point Swamp'. Due to its potential we stopped to check it out and very quickly spotted Common Moorhen (*Gallinula chloropus*) and three Black-crowned Night-heron (*Nycticorax nycticorax*) both new species for the Chagos. Other species present were singles of Great Egret (possibly the same bird seen at the incinerator site), Little Egret (*Egretta garzetta*), Pectoral Sandpiper, Garganey and Grey-tailed Tattler (*Heteroscelus brevipes*). Species seen at other locations over the two days included Lesser Sand Plover (*Charadrius mongolus*), Greater Sand Plover (*Charadrius leschenaultia*), Kentish Plover (*Charadrius alexandrinus*), two Common Redshank (*Tringa totanus*), Terek Sandpiper (*Xenus cinereus*), a Marsh Sandpiper (*Tringa stagnatilis*), Little Tern (*Sterna albifrons*), Saunders's Tern (*Sterna* saundersi), Lesser Noddy (*Anous tenuirostris*), Whimbrel (*Numenius phaeopus*), Grey Plover (*Pluvialis squatarola*), Ruddy Turnstone (*Arenaria interpres*), Bar-tailed Godwit (*Limosa lapponica*), White-breasted Waterhen (*Amaurornis phoenicurus*), Curlew Sandpiper (*Calidris ferruginea*), Common Sandpiper (*Actitis hypoleucos*), Common Greenshank (*Tringa nebularia*) and Sanderling (*Calidris alba*).

On Saturday the Barton Point team took to canoes to begin surveying the lagoon side of the seabird colony, setting off from the dilapidated jetty at East Point on which two Arctic Terns (*Sterna paradisaea*) and eight Lesser Noddy were perched. When I returned to the southern lagoons to rendezvous with Mark and Chris, who had been dropped off to conduct a wader count, I was informed that the elusive Curlew that had been heard but not yet seen was showing well from a point 20m away. After being shown the Curlew, that was later identified from the photographs that Chris had taken as a Far Eastern Curlew (*Numenius madagascariensis*) and consequently our fifth Chagos 'first', I had the good fortune to spot two swifts flying above the distant palm trees that represented another 'first'. Chris quickly classified the birds as Needletails but it took a further two days to confirm their exact ID as White-throated Needletail (*Hirundapus caudacutus*) with some hard won photographs by Chris on the following Monday. Other species worthy of note were Lesser Frigatebird (*Fregata ariel*) and, on returning to East Point to collect the canoeists, the only two Roseate Terns (*Sterna dougallii*) seen throughout our stay on DG, perched on the pier. Two more 'firsts' were found after dinner when it was decided to check out the terns at Pointe Marianne before calling it a day. Whilst counting the terns at rest on the sandy beach Andrew spotted two swifts overhead. It was immediately obvious that these were not the same two birds seen earlier in the day but two different species, one a Common Swift (*Apus apus*) and the other a Fork-tailed Swift (*Apus pacificus*).

Sunday saw the Barton Point team take 24 hours off from the heavy-going survey work. It gave them the opportunity to catch up with the majority of the species, seen elsewhere on the island, most of which remained present at their earlier localities. The day also turned up a stunning adult Indian Pond-heron at the airfield crossover and a second Oriental Pratincole at the incinerator. The other big plus of the day was that Andrew qualified for his ticket to drive a small motor boat within the lagoon in order to reduce the time and effort expended in reaching the Barton Point seabird colony.

Monday turned out to be another rest day for the Barton Point team because after being dropped off at the marina at 0700 they were prevented from taking out a boat due to the inclement weather forecast. Later in the morning the winds picked up and the North of the island experienced a prolonged torrential downpour. However, in the South of the island it remained relatively dry and Chris, Mark and I were able to continue visiting the good birding sites. The day got off to a great start when another 'first', a Common Snipe (*Gallinago gallinago*) was spotted at the Pointe Marianne airfield crossover freshwater pool in company with a Wood Sandpiper (*Tringa glareola*). Unfortunately, after a good show, that allowed Chris to photograph the bird to confirm the identification, the bird took flight and disappeared to the North. Later in the day on our return to Downtown to meet up with the others at 1500 yet another 'first' was found on the 'Oriental Pratincole' field. The tenth 'first' was a single Ruff (Philomachus pugnax) feeding on one of the now very wet depressions in the field along with other waders. Shortly after we were to find out that the others had already spotted the Ruff having ventured out after the storm had passed and they had also observed a lot of seabird movement offshore but without scopes they were unable to confirm the presence of Shearwaters. Consequently, we returned to the sea watching point for an hour and witnessed a steady trickle of 50+ Wedge-tailed Shearwater and a few Flesh-footed Shearwater (*Puffinus* carneipes), many fairly close inshore track NE. Prior to calling it a day we stopped off at the airfield crossover hoping for a second sighting of the Snipe. Unfortunately, the bird had not returned and was not to be seen again; however, there were now four Garganey and two Wood Sandpiper showing.

In contrast to the previous days Tuesday proved to be rather quiet for Chris, Mark and me although many of the good birds found previously were still present. However, the Barton Point Team had a very successful day completing both of the remaining legs of the survey work on Barton Point. The hire of a motor boat for the day proved a real success, allowing the team to cross the lagoon and reach the seabird colony in no time at all with minimal effort - very much a lesson learnt.

The penultimate day on DG was dedicated to surveying the three islets across the mouth of the lagoon in order to complete the seabird colony census. It was a very enjoyable day that involved getting transported to the islets in two Royal Marine rigid raiders - not the most comfortable of boats but none the less a tick in the task book of life. To prevent damaging the coral reefs it was necessary to swim the last few tens of metres to the shore with our kit protected within floating waterproof bags. Thankfully unlike the mainland the islets remain rat free and consequently the seabird colonies are thriving, and we encountered hundreds of Red-footed Booby, scores of Great Frigatebird, dozens of Brown Noddy, 10 Brown Booby (*Sula leucogaster*), White Tern and Lesser Noddy. In addition, West Island still retained a colony of Cattle Egret with a smaller presence on East Island.

One task of the day that Mark and I got a chance to get involved in was to assist Roger, who was qualified in bird handling, to get some more Red-footed Booby feathers (one feather per bird) for a global population DNA analysis of the species. It was incredible to see how clumsy the birds were both perched in the bushes and on the ground, having only previously seen them in the air flying almost effortlessly. One unexpected observation from the day that certainly gave Pete something to think about was why on the smallest islet (West Island) breeding was so advanced in comparison to the other two islets and Barton Point. Red-footed Booby and Cattle Egret nests were lined with fresh material and many had eggs present and/or very young chicks. A sad aspect of our visit to the islets was the amount of litter stranded along the high water marks, proving that the Chagos Archipelagois not quite the pristine environment we imagined. On returning to our accommodation, with the primary aim of the expedition completed, the intended evening visit to the fuel point swamp went by the wayside as all enthusiasm evaporated after the beer came out and pizza was ordered. It was our eighth full day 'on island' and our first early secure!

Thursday, our last day on Diego Garcia, certainly proved not to be an anticlimax. A last tour of the island turned up another 'first' and an additional rarity. In an effort to get better photographs of the Shearwater, Chris was dropped off at a sea watching point in the South of the island where he spotted the final 'first' in the form of two Parasitic Jaeger (*Stercorarius parasiticus*) and the final rarity was a Common Ringed Plover (*Charadrius hiaticula*) at the incinerator site. Other worthy records were a Pacific Golden plover at the Aerial Farm, a second Yellow Wagtail at Turtle Cove Pond, and at the Downtown Sewage Works a fourth sighting of Pectoral Sandpiper. The day also provided Pete with the opportunity to see a White-throated Needletail and to capture a Picturewing (*Rhyothemis variegata*) migrant dragonfly that had never been recorded in the Chagos.

After checking in our luggage at the airport mid-evening we returned to Downtown for the final time for a well deserved meal at PK's (The Peace Keepers Bar) for Mongolian Night. Following the meal it was a case of returning to the airport for the long trip back to the UK via Singapore. We departed Diego Garcia Friday 9 Nov 07 at 0115 in a USAF C-17 having completed all the aims of the expedition and in addition we had seen Lobster Crab, Hawksbill Turtle, Sting Ray and Shark. A total of eleven bird species had been added to the Chagos list and several of the other scarcer migrant bird species observed were only the second or third ever records for the Chagos, confirming previous observations by various parties. The expedition ended when we landed back at Heathrow at 1830 (local).

References

Carr P (2008) *Diego Survey III (2007) - Expedition Report*. Sea Swallow 57 pp16-62

Chantler, P. and Driessens, G. (1995). *Swifts: A Guide to the Swifts and Treeswifts of the World*. Pica Press.

Harrison, P. (1983). *Seabirds an identification Guide*. Croom Helm

Hayman, P., Marchant, J. and Prater, T. (1986). *Shorebirds: an identification guide to the waders of the world*. Houghton Mifflin.

Madge, S. and Burn, H. (1988). *Wildfowl: an identification guide to the ducks, geese and swans of the world*. Christopher Helm Ltd.

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